MODERN PLASTICS

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MAY, 1936 VOLUME 13 NUMBER 9

• OF GENERAL INTEREST

• TECHNICALLY INCLINED

• NEWS AND FEATURES

NEXT MONTH

Brainard H. Brown, development engineer of Taylor Instrument Companies, has redesigned their famous Stormoguide and will tell our readers why in the June issue. He will also show how the molds for the previous design were salvaged in order to develop the new design with minimum expense.

A. J. Norton of Detroit Paper Products Corp. will tell of the rapid rise of Duraloy in the manufacture of breaker strips for refrigerators.

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MODERN PLASTICS

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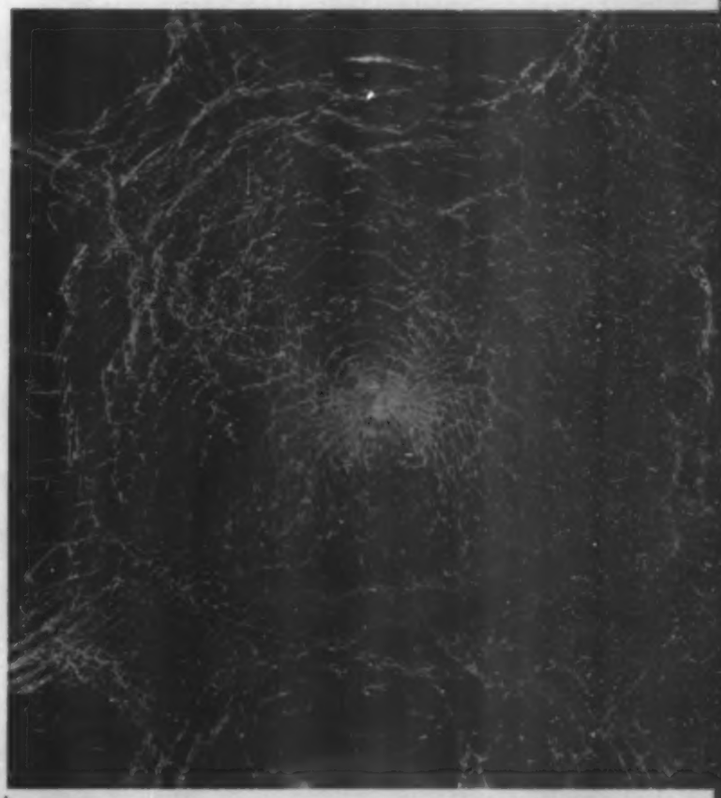
Light and safe for aircraft

BY JACK DELMONTE

A resumé of the needs and development of safety glass and resinous glass by one who has taken an important part in it

WITHIN the past few years there has been considerable attention devoted to the development of transparent plastics for airplane windows. A wide variety of materials is available, exhibiting extremes of physical properties. Some are synthetic resins and others are cellulose derivatives, all are designed to meet a growing market. For the most part, transparent plastics in airplanes are utilized on the windshields and the large cockpit enclosures. Emphasis is placed upon the airplane requirements, as these materials experience no greater physical and chemical demands in any other branch of service. The extreme heat of the tropics, averaging about 120° F., and the intense cold of the arctic and stratosphere regions, averaging about −30° F., are two atmospheric conditions under which the same material is expected to behave satisfactorily. To better express the temperature requirement, the plastic must not be too soft at 120°F., such that it will sag under its own weight or take a permanent set after small applied pressures; and still



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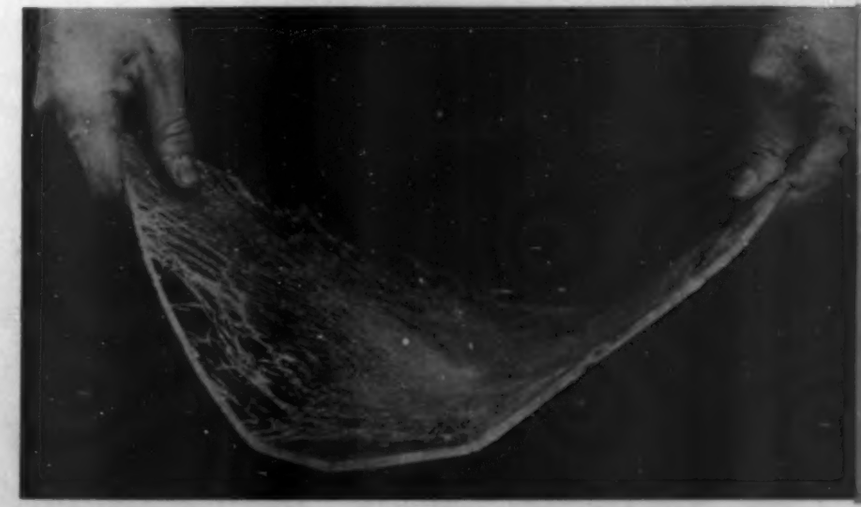

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Above is an illustration of a piece of finished safety glass which even when struck with a hard blow retains its glass segments and does not shatter. At the left is a sample of laminated glass that is tough and elastic and will stretch almost 1000 per cent. before breaking

it must not be too brittle at −30°F., such that it is hard and unyielding. The temperature coefficient of plasticity must be as low as possible.

For aircraft purposes the transparent plastics must be supplied in sheet form, though manufacturers do maintain stocks of rods, bars, and tubes. The gages of the sheet materials vary anywhere from .060 inch to .250 of an inch. These sheets are employed as glass substitutes in windshields and cockpit enclosures. To trace their development it becomes necessary to refer back to the safety or laminated glass, which was originally developed for the automobile industry, to eliminate the hazards of flying glass during accidents. The laminated glass is nothing more than two plates of sheet glass, between which is sandwiched a thin film of transparent plastic. The chief concern of the early investigators was the preparation of a plastic material that would not impair the vision of the plate glass layers. Pyroxylin or cellulose nitrate plastic gave the first satisfactory results. Using about two parts of pyroxylin and one part of camphor as a plasticizer, a suitable plastic was developed. This cellulose nitrate plastic was not very stable under the action of light and heat, turning yellow under continued exposure and soon becoming opaque. However, when placed between two sheets of glass, as in the laminated construction, the destructive short wavelengths of light were blocked out by the plate glass and the cellulose, nitrate plastic exhibited a longer life.

About two years ago, the cellulose acetate plastics were developed to replace the cellulose nitrate plastics. They soon proved their worth by a better resistance to discoloration by sunlight and decomposition by extremes of atmospheric heat, than their predecessors. In this group of plastics, cellulose acetate comprises 2/3 to 3/4 of the bulk, with a suitable plasticizer forming the remainder. A series of life and durability tests were conducted on laminated glass, using as one product the cellulose nitrate plastic and as the other, the cellulose acetate plastic. They were exposed to a quartz, mercury lamp under specified conditions. The cellulose nitrate plastic broke down after 750 hours and the laminations separated. As a contrast, the cellulose acetate had not failed at the end of 1000 hours and the laminations remained intact, with no evidence of decomposition in the transparent layer between the glass sheets.

In order to cement the transparent plastic layer to the sheet glass it was necessary to use one of two groups of materials: 1. Foreign substances like glue, gelatin, or casein, or 2. Cellulose derivatives, which in combination with special resins give materials that will adhere to glass surfaces. These bonding reagents always added to the labor and the cost of preparing the finished product. It was necessary to leave a 1/8th in. groove along the edge of the laminated glass, which was filled with a thermoplastic sealing compound to render the transparent plastic layer proof against the atmosphere and the weather. Thus there is available the finished safety glass, which, when struck by a hard blow prevents the shattering and the scattering of glass, as the plastic layer retains the glass segments. Figure 1 is an illustration of a typical piece of safety glass that has been cracked.

There have recently appeared on the market two new transparent plastics which are said to be more satisfactory than the cellulose acetate plastics in the application to laminated safety glass. Vinal and the acrylic resins possess desirable qualities for the transparent plastic layer. Both of the substances are synthetic resins. Vinal is composed of a synthetic resin of the vinyl group, called (*Continued on page 60*)

A typical modern airplane, showing the applications of transparent plastics over cockpit enclosures

3

"Queen Mary," superliner of the Cunard White Star Line, will begin her first crossing to this country on May 27. She is shown above leaving Clydebank, Scotland, on the River Clyde en route to Southampton. When she leaves Southampton, she will be commanded by Captain Sir Edgar Britten, R. D., R. N. R., present master of the "Berengaria" and commodore of the Cunard White Star Fleet

There are three good reasons for our presentation of this timely pictorial monograph of the "Queen Mary" aside from the natural news interest of her arrival. First: she represents the present zenith of marine architecture and construction as well as the most advanced thought in interior decoration and luxurious transportation. Second: The safety and comfort of her passengers and crew is safeguarded in no small measure by the strategic use of more than one hundred and ten thousand square feet of fire-resisting laminated plastics, sixty thousand of which is for decorative paneling, and the remainder for table tops, and such. Third: Practically all this laminated plastic material was made in this country by an American laminator

1 Section of the Cabin Smoke Room in which a mural painting by Edward Wadsworth appears over the fireplace. Tables in this room will have blister-proof plastic tops

2

2 Tourist Class Bathroom paneled with mottled brown laminated plastic material. Two hundred and fifty Cabin Class Bathrooms are similarly paneled in pearlescent oyster white

3 Cabin Dining Room looking toward the decorative map by MacDonald Gill. Progress of the ship will be traced daily upon this map showing its constant location. Although incomplete when photographed, the room expresses a feeling of refined grandeur and quiet dignity

3

4 Cabin Restaurant in which the furniture had not been placed when this photograph was made

5 Main Swimming Pool, which was the first major part of the big vessel to reach virtual completion. Smartly decorated with porcelain tiles of straw color crossed by bands of emerald green and fire-box red, the pool is definitely in the modern mode

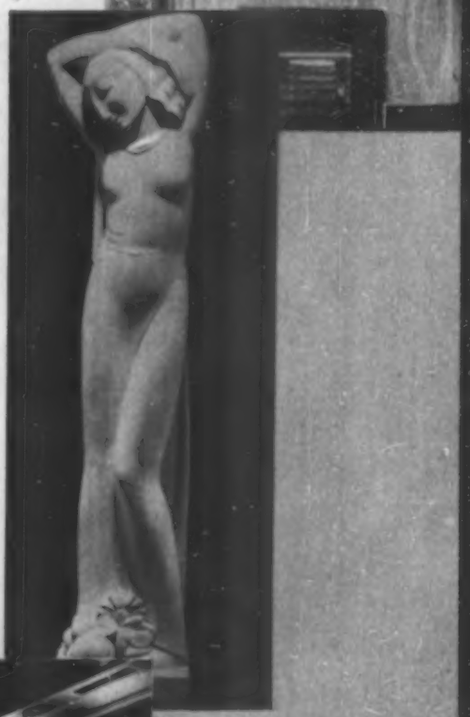
4

6 One of a series of four statuettes carved out of wood for the Main Staircase of the Tourist Class. Norman J. Forrest is the sculptor

7 Painting by Kenneth Shoesmith over fireplace in Cabin Drawing Room

5

7



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8 SKETCHES BY CHESTER B. PRICE

9

10

8 The artist's conception of the interior of a Living Room for one of the Special Suites. One could scarcely imagine himself afloat in such homelike surroundings where every convenience and comfort is painstakingly provided. Practically all upper deck staterooms have private baths. A telephone system connects more than 500 of these staterooms and a number of apartment combinations are possible. The temperature and ventilation of these rooms are under the direct control of passengers

9 Interior of De Luxe Stateroom, also in the modern manner, where happy restful hours of luxurious leisure will mark each voyage. Tops of drawer-chests, bedside tables, smoking tables and mantels are of blister-proof plastics where carelessly lain cigarets or spilled drinks can do no harm

10 The Forward Observation Lounge on the Promenade deck is located immediately under the Bridge and commands a magnificent view over the bow and sides of the ship. The room is 34 feet long, 70 feet wide, and 12 feet and 6 inches high. Twenty-one large windows will make the changing moods of the ocean the dominant decorative feature of the room. The rare woods, mazure birch and bubinga curl, are used. A carnival painting by A. R. Thompson, one of the better known younger British artists, will be featured over the semi-circular bar. Metal work is in silver and bronze. Bar and table tops are of laminated plastics for safety and permanence

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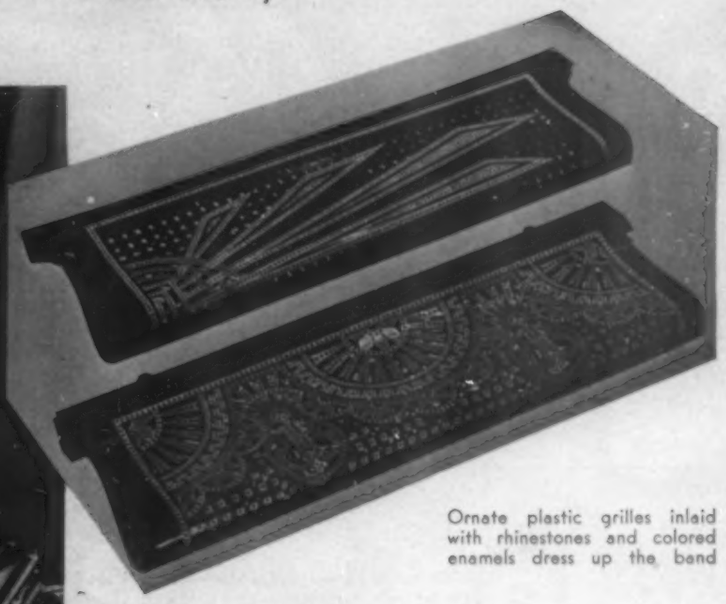
In tune with economy

By JEAN MAYER

Lowered prices with maintained quality is an accomplishment these days in which plastics figure conspicuously in the musical instrument industry



Ornate plastic grilles inlaid with rhinestones and colored enamels dress up the band

THE importance of musical instruments to the art of music is, of course, mammoth, since one cannot go far without the other, and these instruments must have sensitive tonal quality, attractive appearance and durability if they are to serve their purpose well. With these requisite features it is no wonder that many instruments are being made of plastics or decorated with them.

Accordions which were made of wood for many years have been recently completely remodeled using a laminated plastic housing and The Accordion Engraving Company is producing many of these instruments for popular orchestras and bands.

"We have discovered," says Mr. Rabuazzo of that company, "that plastic materials make our instruments lighter to handle. This is important because when a musician must carry an instrument around for long periods of time, the lighter the strain from weight the more practical it becomes. Not only that, but plastics seem to heighten the tonal quality of the accordion. We have found that truer, purer notes are available now that we are using a plastic case. The reason is not easily explainable, but it is nevertheless an established fact.

"Of course, you know," he continued, "these materials are easily cleaned and since we frequently use light colors and complicated decorations, it is essential that finger marks be easily removed and its luster and finish retained."

The accordion illustrated has employed cellulose nitrate to the fullest possible extent. For instance, all the keys on the keyboard are made of these materials and no amount of handling, perspiration or dirt which often accumulates on the keys, will dull that lustrous surface, since a wet rag renders it as good as new. The one hundred and twenty basses are all plastic, too, and here again the same advantage of keeping them clean and fresh is obtained.

In certain places where a thick surface is required, wood is laminated with cellulose nitrate but on the parts where a thin delicate surface is ample the sheet material is sufficient in itself. Behind the keyboard is a grille which is the novelty element of the instrument. This is a plain strip of cellulose cut with a jig saw and decorated with a (*Continued on page 56*)

Molding for better design

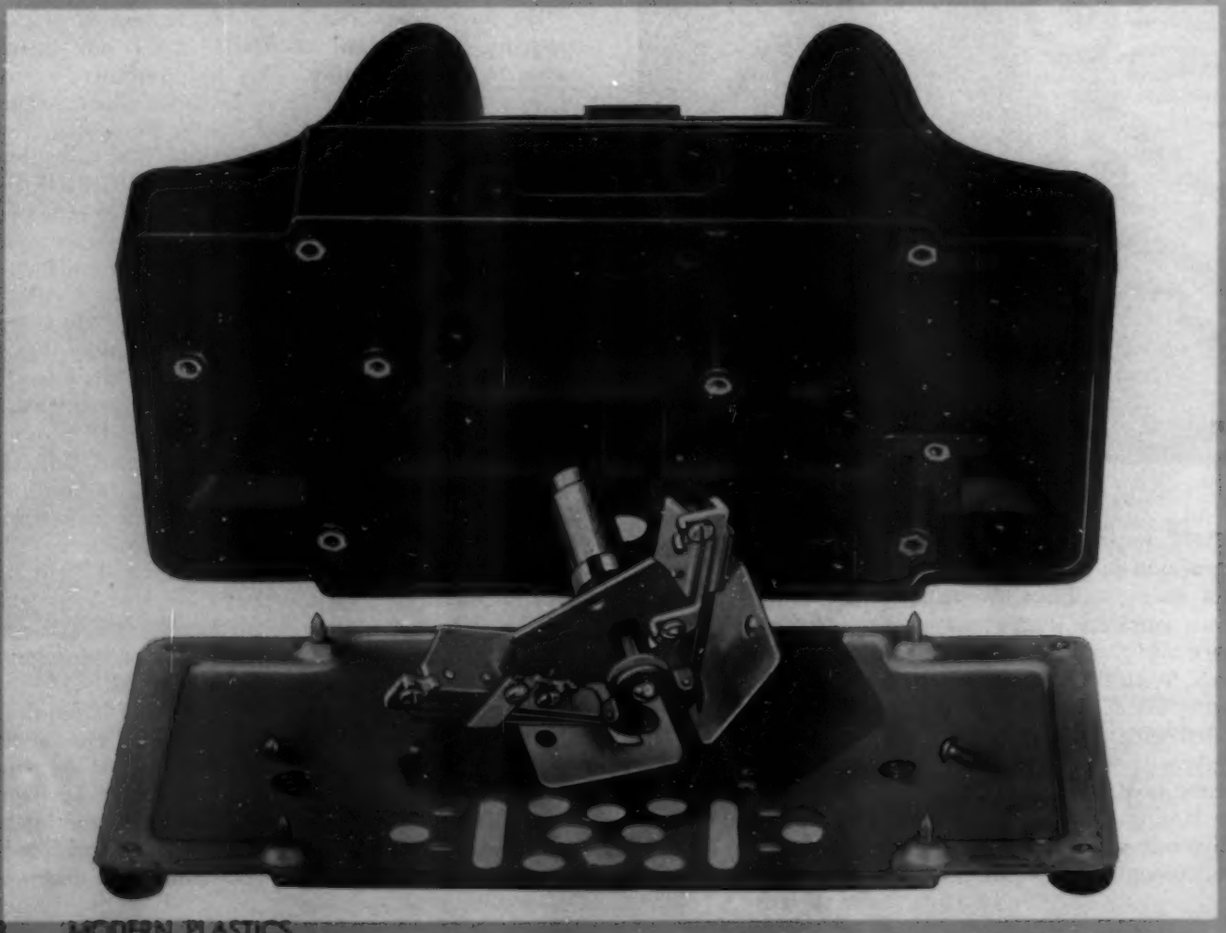
Telephones need not be incongruous with good interiors as this manufacturer demonstrates through molded design

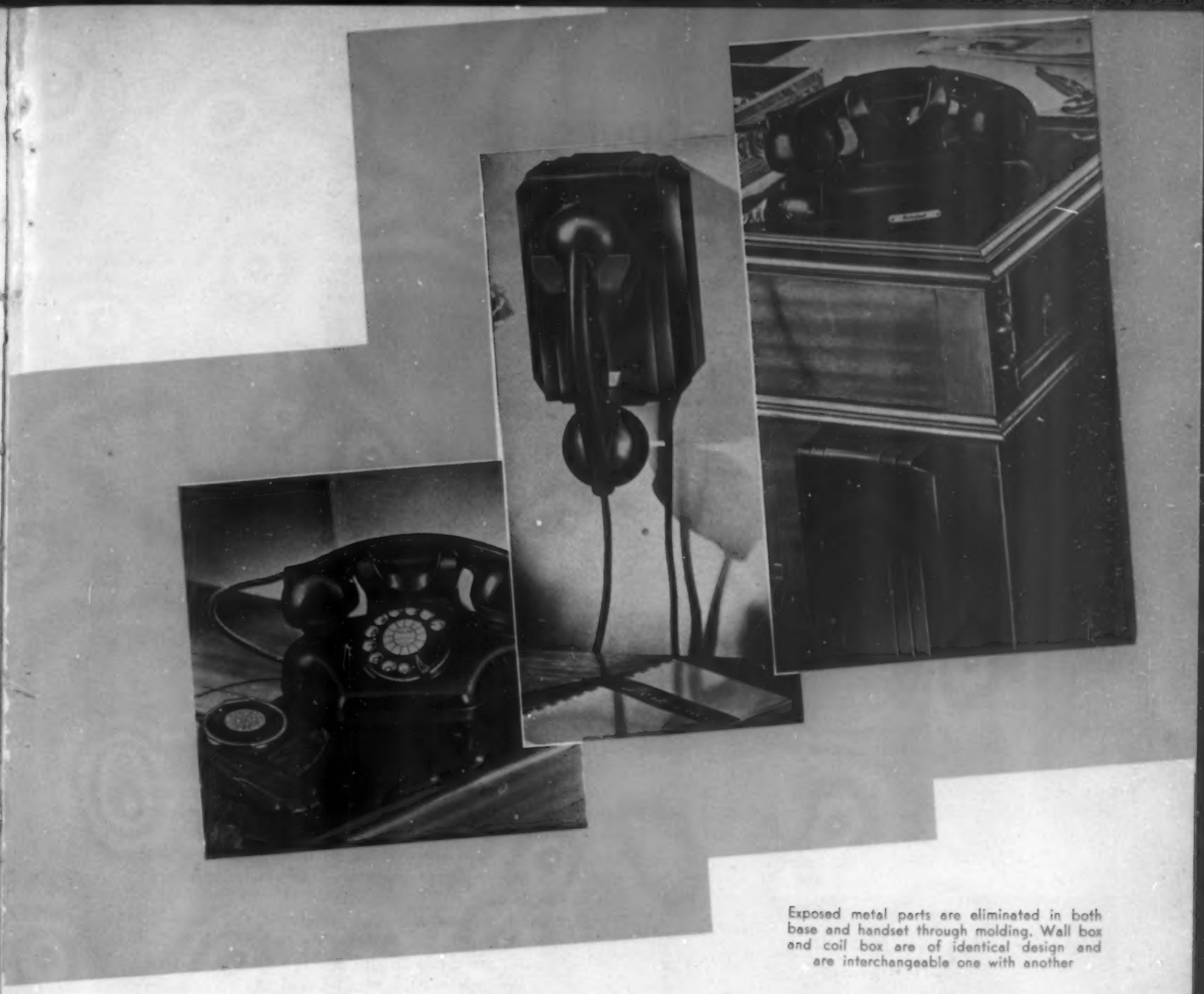
SOME thirty years ago, the Kellogg Switchboard and Supply Company developed and manufactured the first handset telephone in this country. This instrument was called the "Grabaphone," but in those days, and sometimes even now, the handset is variously referred to as a "French" phone or cradle phone. The Grabaphone was widely accepted and thousands are still in active service throughout the world. Eventually there were other handset telephones which put in an appearance. But the real trend toward this type of instrument came only a comparatively short time ago.

Being progressive in the development and manufacture of telephone equipment and apparatus, the Kellogg Company was naturally among the first to feel the impulses which forecast the trend to standardize on handset telephones. And they were ready with the Masterphone, their newest contribution to the industry, to meet this trend. The only similarity between the old Grabaphone and the new Masterphone, however, was the type of instrument—both being handsets which were designed for the convenience of the user, allowing one hand to be free for writing, etc.

The Masterphone was a completely new job of engineering from the smallest mechanical and electrical part to the exterior finish. It was the vanguard of all telephones of the future. It was the first handset on the market made of all Bakelite with no exposed metal parts. It was the first with modern streamline design and an oval base. It was low, compact and the

The molded base of the Masterphone is an interesting example of engineering perfection in which inserts become automatically insulated and integral with the molding itself





Exposed metal parts are eliminated in both base and handset through molding. Wall box and coil box are of identical design and are interchangeable one with another

first handset to establish small size as a desirable necessity. It was also first with easily removable capsule type transmitters and receivers; having bronze double contact clips in place of the usual cord connections to the transmitter and receiver units. It had a reinforced handle made possible by molding two heavy brass bars through the center which also served as the electrical connection link between the transmitter and receiver. All cord connections in the base were made direct to the switch assembly thereby eliminating the usual connecting rack and complicated wiring. It was designed so as to eliminate the necessity for special maintenance tools. In addition, the Masterphone was the first telephone to have a non-positional transmitter. The development of this new type of transmitter is a story in itself. Suffice to say here that it has done more to popularize handset instruments than any other single factor. Its patented curved electrode construction, which forms a spherically shaped carbon chamber, keeps the transmitter from going "dead" whether a subscriber bends over, leans back, lies down or tips the phone to any abnormal position or angle.

From the telephone man's standpoint of size, beauty and efficient transmission and reception, the telephone industry is constantly striving for further progress in efficiency and to cut down installation and maintenance costs. Understanding this, it was a natural sequence to want handsets which would include in one instrument all the parts usually found in both the telephone and the desk set box.

This demand for a combination handset brought with it the necessity for further developments if such a telephone was not to be large, unsightly or difficult to handle. The ringers, induction coils, and condensers in present desk set boxes are of a large size. To make handsets which would meet the requirements of small size appearance and convenience, it was necessary to develop smaller parts. Miniatures of present parts would not do because the same efficiency standards had to be maintained.

The Kellogg laboratories have had these developments under way for two years, utilizing new principles of design and engineering, and new plastics materials. The goal was *(Continued on page 51)*

Stoves, too, sell on appearance

BY W. N. SHEPARD

Since colors became so important in kitchens, stoves are being perked up with colorful plastics. They are good insulators against heat, as well

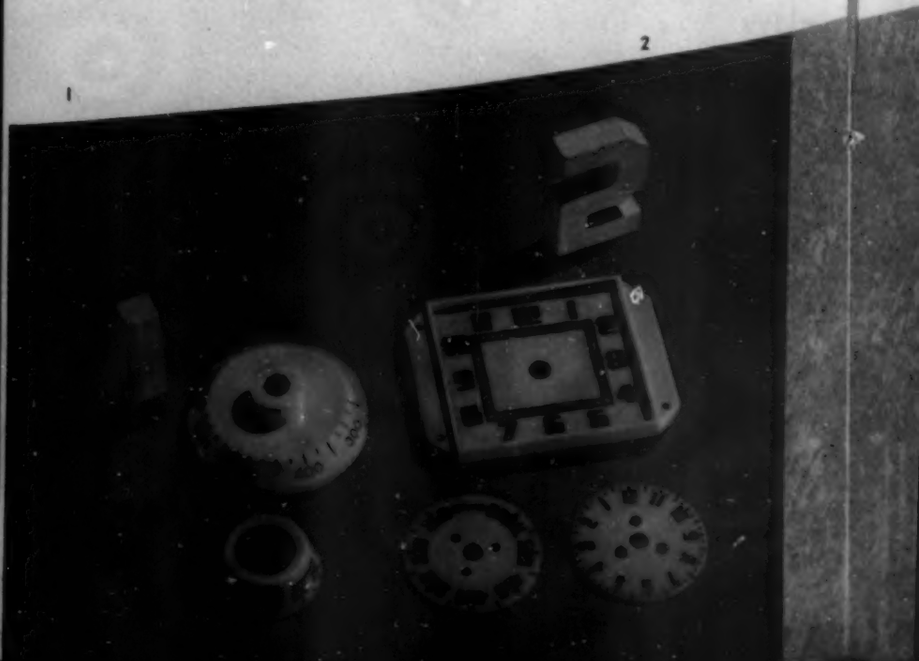
IN the new lease on life which the stove industry has recently taken, especially those branches which utilize gas and electricity as the heating element, plastics have played a large part. The battle which the stove companies have been fighting, along with automobile manufacturers, is one involving the replacement of obsolete ranges with new and superior models. Building has been at a minimum, and the stove industry along with the contractors and building material companies would have suffered much more than they have, had they not concentrated on producing replacement stoves that were mechanically superior to earlier models, easier and more convenient to use, and more modern and attractive in appearance.

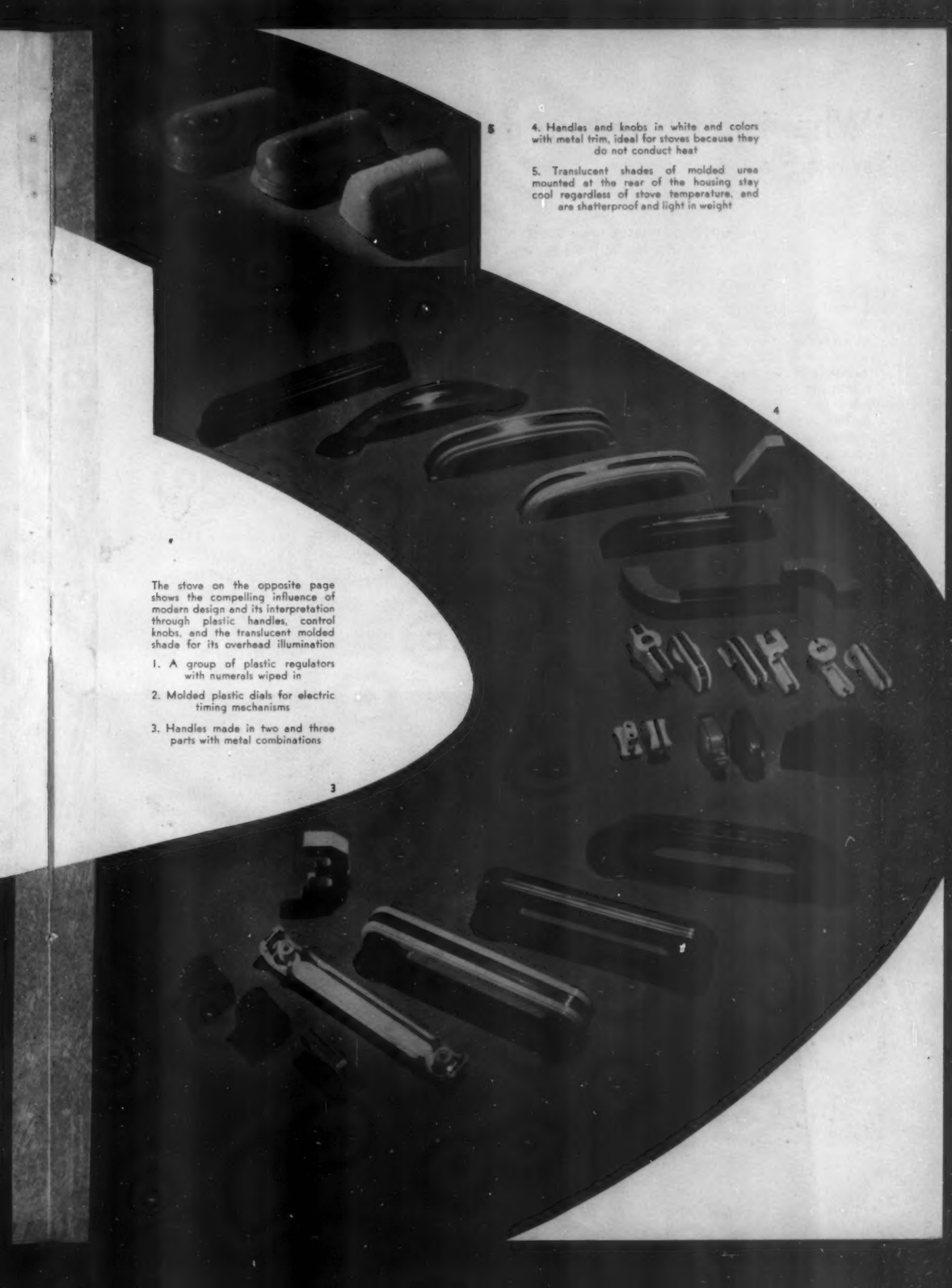
Stove engineers and designers, in building new models, have taken good advantage of the unusual qualities which plastics, as a new fundamental material, offer. Most important to the gas range manufacturer is the fortunate inability of plastics to conduct heat; this characteristic together with excellent dielectric properties, color and permanent finish, make plastics ideal for oven door handles, heat control regulators, switches and so forth used on electric stoves. These are, and probably will remain, the most important applications of plastics on the modern stove. But not to be neglected are the colorful translucent urea lamp shades, the built-in plastic timing devices, convenient condiment sets, and other incidental trim which distinguishes one manufacturer's range from another.

So we find plastics widely used on practically every make of gas and electric stove produced today, partly because of physical properties superior to any other known material, and partly because of molded plastics' permanent finish, attractive appearance, and ability to lend itself easily to modern design. Heat resistance being no problem, the general practice is to use the dark phenolic materials for inexpensive ranges, and the colorful ureas for stoves selling in the higher price classes.

Illustrated are a number of plastic handles, in both phenolic and urea materials, which are interesting from the standpoint of design. Note the handles and switches which are hollowed out from the rear, to obtain a saving in the amount of material in each piece, withal allowing for adequate strength. Then too, these thin sections allow for quicker curing time, and incidental economy in production. Advantage is also taken of the fact that inserts may be molded in pieces where necessary, or the pieces may be easily drilled and tapped, then screwed on to the stove. This appeals to the engineer because of the latitude which it allows him.

Improved appearance and utility of the stove is always foremost in the designer's mind and it is interesting to note the beautiful effects which have been obtained through plastic handles and gas cocks since the first phenolic handle was used. The first step was the introduction of white and colored urea pieces; then the combination handle in three parts—perhaps the two end pieces which are (*Continued on page 53*)





The stove on the opposite page shows the compelling influence of modern design and its interpretation through plastic handles, control knobs, and the translucent molded shade for its overhead illumination

1. A group of plastic regulators with numerals wiped in

2. Molded plastic dials for electric timing mechanisms

3. Handles made in two and three parts with metal combinations

4. Handles and knobs in white and colors with metal trim, ideal for stoves because they do not conduct heat

5. Translucent shades of molded urea mounted at the rear of the housing stay cool regardless of stove temperature, and are shatterproof and light in weight

What is this injection molding?

BY VINCENT D. HERY

A popular question discussed by one who knows the answer

INJECTION molding—that is, forcing hot, plasticized thermo-plastic material into a cold mold through a comparatively small orifice, is a process which has been known for at least twenty years. Up to a few years ago injection molding was not used commercially by the plastic molding industry. Because of recent developments, it is now the opinion of many leaders in the plastic molding field that injection molding of thermo-plastic resins will soon find its rightful place in the molding industry. It is also the opinion of many that injection molding is one of the most interesting as well as the most intricate subjects in today's plastics.

During the last five or six years much has been done to place injection molding on a high production basis, especially in Europe. Very recently the molders in this country have turned to injection molding and are rapidly developing high production methods. This is best shown by the number of products that are today being injected by the jobbing molder as well as the industrial molder.

The reason for this rapid development is apparent when we stop to consider the type of articles that lend themselves to injection molding and the rate of production that can be obtained.

A few years ago this statement would have seemed incredible, but the molders are now actually injecting these parts at a very high rate of production because they are using all the advantages that injection molding has to offer today, even though these advantages lay dormant for a number of years past. It seems almost unbelievable that injection molding and its advantages could be known for so long and still not be put in use by the molder. To be fair to the molder we must point out the reasons why this process lay idle for so long.

Until recently suitable thermo-plastic materials and injection equipment were not available for the use of injection molding. Today both are available to the molder and he is fast taking advantage of the rapid production made possible through the perfection of this process and these materials. Since the thermo-plastic materials such as Tenite, Lumarith, Plastacele, Masuron, Victron and many others are well known,

Figure 1 illustrates a number of small intricately shaped parts which have been injected on a full-automatic machine. Some of these parts have cross-holes; some have difficult shapes; all have comparatively thin walls. Most of these parts have been molded at five injections per minute with from one to six parts being produced per injection

2

Figure 2 illustrates a variety of parts which were injected automatically despite their very difficult shapes. A close study of these two illustrations will reveal that many of these parts would be practically impossible to mold by the standard flash type molding, while with injection process they can easily be molded automatically with exceedingly high production and low mold cost

we will deal more with the equipment necessary for injecting.

Within the last year and a half an automatic machine, illustrated in figure 3, has been placed on the market. This machine, sold by the Index Machinery Corporation, has contributed tremendously to the advancement of injection molding by virtue of the fact that it is fully automatic and the cycle is controlled automatically by electric time clocks which insure uniform production. To the writer's knowledge it is the first completely automatic machine that has been applied to molding, either for thermo-plastic or thermo-setting materials. The molders are, therefore, taking advantage of this development. The production possibilities on this machine are remarkable. It is a self-contained electric unit and has a possible injection rate of six strokes per minute.

In injection molding the number of injections usually depends upon the thickness of the cross-section of the part, which determines the setting or cooling time for the injected part. To show the possible production, let us assume that we have a small circular part ½ in. in diameter with a cross-sectional thickness of .050 inches. The part may have threads either inside or outside or be perfectly flat, but the fact remains that our sample has a .050 in. cross-section and this thickness determines the setting time required or number of injections per minute. For this part a twelve-cavity mold may be used and the mold operated at five injections per minute, resulting in a production of 3600 per hour or 28,800 per eight-hour day. With a twelve-cavity mold this rate of production is extremely high in comparison with any other method of molding.

With all new developments new problems present themselves. In injection molding the problems are many and varied. The first problem in any type of molding is the selection of the proper material. Upon the type of material selected naturally rests the design of the mold, that is, the size and thickness of the gates and the location of these gates in relation to the cavities. By gates we mean the runner or flow gates to each cavity, as well as the gate from the material cylinder to the mold, and its thickness usually depends upon the cross-section of the part to be injected and the shape of the part. With this thought in mind, it is usually best to place the gate directly upon the thickest cross-section of the (*Continued on page 58*)

Editorial comment

IT IS probably not realized by many that plastics is the most rapidly growing industry in this country today. Revolutionary developments are quietly taking place which within the next year or two will alter the picture of basic materials tremendously. The progress made by synthetic industrial finishes during the past few years will serve as an example. Government agencies are conducting almost thorough survey of the field in order to report more accurately than has been done, the facts and figures of the industry for public information.

There is no static in this modern industry. Old formulas are being improved to produce more suitable and stable plastic materials. New formulas are being created and put through the paces of initial experimentation. New techniques in handling and fabricating the materials are being developed and watched by those whose interests they will affect. New plants are being quietly erected for the production of new materials. Everywhere there is growth and expansion worthy of the closest consideration and review. Industry cannot afford to close its eyes to the possibilities of economy and improvement in the manufacture of its consumer goods which are offered in one manner or another by modern plastics.

On the other hand, neither industry, nor the designers and engineers who create its products, can afford to choose plastics blindly or loosely and assume that they will always make suitable substitutes for older materials they have previously used. They must not assume that these new materials can be employed in the same old ways and bring equal results. These new materials require new technique in both handling and design. Their physical properties must be studied and understood if anything like satisfactory results is to be obtained. How can this understanding be brought about? We believe there is no better way than through the Competition we are now sponsoring.

ON EVERY hand there are splendid examples of the intelligent use of plastic materials. Some of them are more outstanding than others. Many of them illustrate the value of functional design. Others are not only exceedingly useful but are good-looking as well. It is the purpose of this Competition to bring these examples forcefully to the attention of all those interested in the materials in any way, that they may profit by these experiences of others.

Decorative laminated plastics in the hands of skilled architects are capable of adding real beauty, utility, and permanence of finish to almost any job. Light, translucent colors are available and their ability to resist fire, alcohol, and other dangers to which finishes are often exposed, make them invaluable wherever permanence is desired. The four-page insert between pages 16 and 17 of this issue is a case in point.

Cast resins are in themselves beautiful. It is the manner in which they are handled and fabricated which determines whether they will have to seek their eventual market in exclusive shops or in chain stores. The thought so often expressed that plastics are cheap materials suitable only for mass markets is all rot. Beautiful examples of exquisitely designed ornaments are sold in many high-class establishments. Creators of fashion in Paris, and in this country as well, have shown clearly during the present season what may be done with intelligent handling and design.

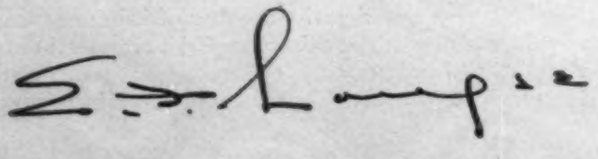
INDUSTRIAL uses of plastic materials are so well known to those who use them that they entertain a feeling that there is no need for their exploitation. This is hardly the case, and one has only to begin a conversation with almost any manufacturer outside the plastics industry to learn how little he really knows about the possibilities of these materials. The molder or laminator who manufactures industrial plastics is so close to his products, and makes them in such enormous quantities, that he sometimes labors under the impression that everyone knows all about what can be done and what can't be done with plastic materials. If these men could take the time to read just one batch or our daily mail, they would soon change their opinions. They would realize the tremendous amount of educational work that is necessary before industry in general will accept their products in anything like the quantities they merit. They would quickly realize, too, the vast potential market that lies at the end of such education. It is our hope that this Competition will bring into prominence some of the remarkable things that are being done with such nonchalance in the industrial field.

This Competition offers the manufacturers of cellulose plastics an opportunity to refute the whispered claims that these materials are being rapidly displaced with other thermo plastics of greater merit. It offers them an opportunity to demonstrate the strides made recently in rapid production with automatic injection molding, and the incidental savings in the costs of multiple cavity molds. It also offers a chance to demonstrate the peculiar toughness of this material and its ability to combine effectively with metals where structural strength is required.

THE Competition offers tool and machinery manufacturers an opportunity to enter the products of their equipment and to give comparative costs between the various methods of handling and fabricating all sorts of plastics.

And best of all, perhaps, is the opportunity offered to material suppliers to present the products of their improved formulas and of their new materials just being launched, or about to be launched into a huge market of potential buyers with large sums of money to spend. This is particularly opportune for those manufacturers of the new glass-like transparent materials whose markets in the field of transportation are already established. Markets in other fields will rapidly follow and they will depend almost entirely upon the imaginations of designers who are waiting and watching these intriguing developments.

In fact, Modern Plastics Competition offers everyone in any way interested in plastics, an opportunity to show everyone else just what has been accomplished with these important fundamental materials. Everyone is cordially invited to enter the Competition. No fee is required. Entry blanks and further details may be obtained by writing Modern Plastics Competition, 425 Fourth Avenue, New York City. The important thing to remember is that designs will be judged not alone by line and form, but by the appropriateness with which plastics are used in the application entered. All entries must be in by August 15, and it isn't a minute too early *NOW* to start them coming.



Stock molds

SHEET ELEVEN

BELOW is pictured a diversified group of stock handles and knobs for use on everything from a coffee-pot to a radio. They are simple in design and a number of manufacturers will find them suitable for a variety of purposes. For prices and samples send your request to the Stock Molds Editor on business stationery. Be sure to mention sheet and item number when writing.

179. Coffee-pot handle 4 1/8 in. long, 2 1/4 in. wide

180. Octagonal screw-in handle 3 3/4 in. long

181. Handle 2 5/8 in. long with opening at both ends; 1/4 in. diameter at one end and 1/8 in. diameter at opposite end

182. Handle with opening at top and bottom; 1/4 in. diameter, length 2 inches

183. Handle slightly knurled top, tapering body; opening 3/8 in. diameter, hollow interior

184. Handle 1 9/16 in long with screw

185. Knurled edge knob, depressed center, non-threaded insert; 11/16 in. diameter at top

186. Tube socket base: diameter 1 1/4 in., height 1 3/8 inches

187 Knurled and decorated control knob, threaded opening 5/16 in. Diameter at top 1 5/16 inches

188. Knob with knurled edge and threading. Opening 5/16 in. Diameter at top 1 1/4 inches

189. Radio knob with ornamented top and knurled edges; 1 in. inside diameter

190. Knurled edge flat knob; diameter 1 in., opening 1/8 in., threaded insert

191. Knob, opening 1/4 in. dia.

192. Knob. 1/8 inch opening threaded; 1/2 in. diameter

193. Shelf support, 7/16 in. opening

194. Knurled knob, opening 1/8 in.; diameter 9/16 inches

195. Rectangular knob 1/8 inch threaded opening

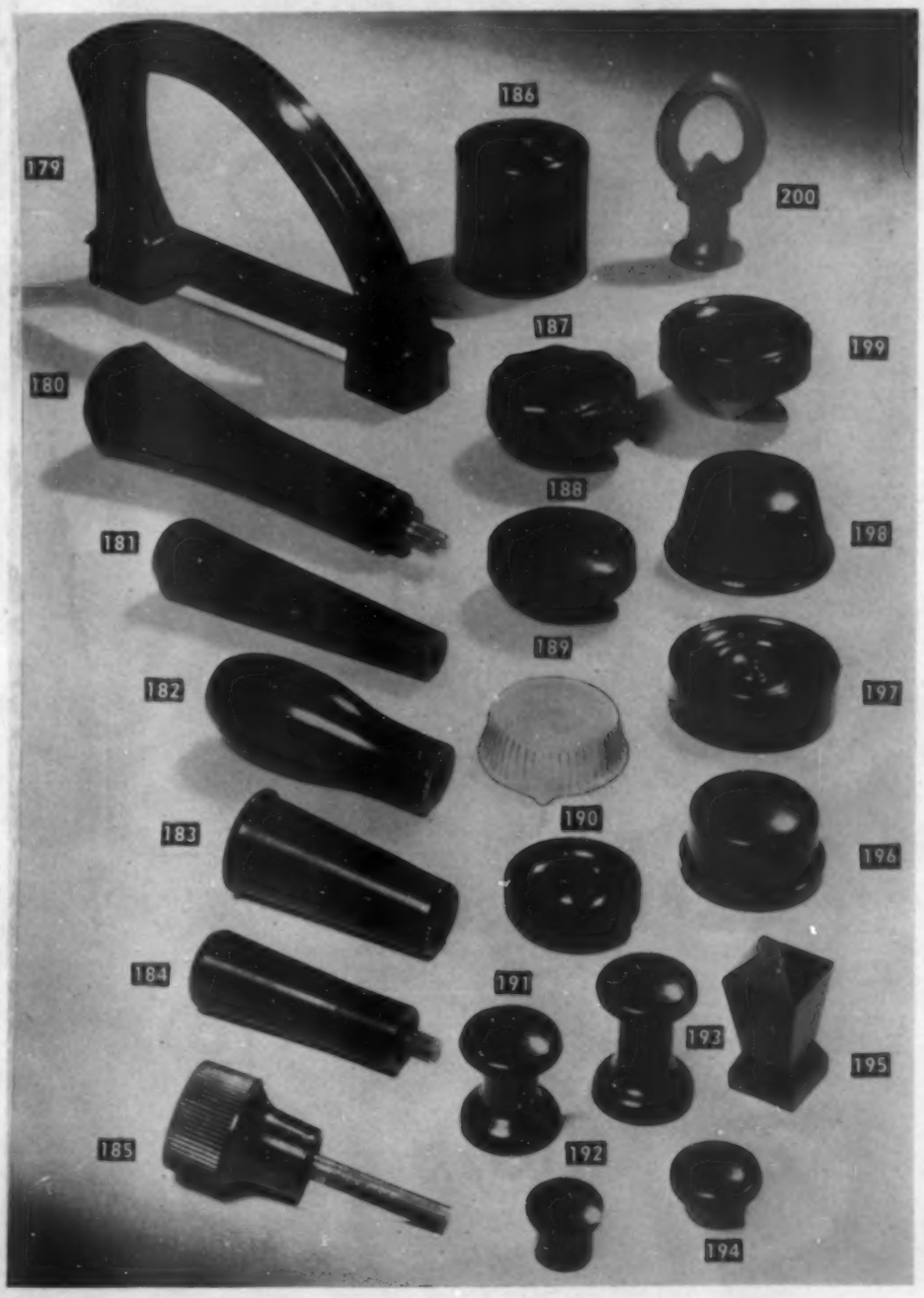
196. Horn button 11/16 in. inside diameter

197. Checkerman 1 3/8 in. diameter

198. Radio control knob, knurled edge, 1 1/4 in. diameter

199. Control knob with ribbed sides; 1/4 in. opening, 5/16 in. diameter at top which is depressed

200. Ornamental finial. Opening at bottom 1/16 inches



Address all inquiries to Stock Mold Department, Modern Plastics, 425 Fourth Avenue, N. Y. C. All molders are invited to send samples from stock molds to appear on this page as space permits.

Stock molds

SHEET TWELVE

POPULAR demand for articles of the type shown on this page urged us to present these items. Since women are again knitting in the home, requests for needles of standard sizes have reached unusual heights. The smart clock case will be an attractive exterior for any works. All are available from stock molds. Requests for samples and prices answered promptly by our Stock Molds Editor. Please mention sheet and item number when writing.

201. Clock case with decorated face and graduated top. Opening for clock-face 3 1/4 in. diameter. Case 6 3/8 in. high and 4 5/8 in. wide. Equally good for instrument housing
202. Medicine container with finely knurled edges on closure and a glass applicator container is 2 3/8 in. high and 3/8 in. in diameter
203. Typewriter spacer bar 7 1/4 in. long and 1/2 in. wide
204. Coffee, flour or sugar scoop which when level holds 1/4 cupful
205. Checkerman 1 5/16 in. in diameter and 3/16 in. thick
206. Small decorated picture frame 4 in. long and 2 1/4 in. wide; uneven border about 3/8 inches
207. Circular knitting needles; standard no. 3
208. Circular knitting needles which are a combination of steel and plastics; standard no. 3 and very flexible
209. Knitting needles with black button handles; standard no. 5
210. Plain lamp shade 3 11/16 in. high, diameter at base 4 1/8 in.; diameter at top 2 13/16 inches; light weight, translucent

If we were giving medals . . . we'd pin one on . . .

R. A. ST. LAURENT

DONALD DEW

GEORGE H. BOEHMER

Donald Dew, president and pioneer organizer of the Diemolding Company, because within a few years he has succeeded in bringing this firm to the front line of molding concerns; because his skill in engineering won him the position of industrial engineer with the Remington Typewriter Company immediately upon his graduation from Cornell University in 1915, and merited his recognition as a member by the American Society of Mechanical Engineers; because his diversified experience has run into no less important channels than the United States Army in which he held the commission of Second Lieutenant of Engineers at Camp Humphries, Virginia, training unit; because his flair for leadership was transfused into politics, and for two years he served as mayor of Canastota, New York.

R. A. St. Laurent, because he believes as sales director of the Bakelite-Rogers Co., Inc., that in this rapidly growing plastics industry, the size of its market and the number of its applications are limited only to the ingenuity and energy of its personnel; because he is an "ace" man in the selling field, with the background of director of training schools of the Standard Oil Company (Indiana) in Chicago and administrator of their technical educational program; because as a young man from M. I. T. graduate school, he stepped into the position of assistant to vice-president of Arthur D. Little, Inc., chemists and engineers; because his hobby is developing markets for old and new products—as well as the rather unique diversions of mink raising and uncovering interesting spots in Northeastern Canada.

George H. Boehmer, general sales manager of the Celluloid Corporation, because his march of progress to his present office is a typical American "success" story; because by virtue of determination and natural ability he forged his way through billing, sales correspondence, production control, stock and shipping departments, went through the racks as a cub salesman, and acted as sales director of the sheet, rod and tube division of the Celluloid Corporation before he arrived at his present job; because his love for his work is seconded by nothing less interesting than a farm in Connecticut where his ingeniousness with carpenter's and mason's tools is evidenced on all sides.

Plastics and die castings combined

BY HERBERT CHASE, M. E. *

ANYONE who has made a study of plastics and die castings is quite sure to be impressed by the similarity of the processes by which they are made available in useful forms. More important from the standpoint of the designer and the users of various products, however, is the facility with which they are combined, often with great advantage both in appearance and utility.

Plastics possess color which is available in great variety and often in any degree of transparency, translucency or mottled effects, and the color goes clear through the piece. They have ample strength for many uses, yet lack the strength and toughness of most metals. Even the strongest forms, (laminated and fabric filled) have certain limitations.

Die castings, too, have their limitations. In themselves they have only the color characteristic of the metal from which they are made, and exposure of this metal results in tarnishing and sometimes in corrosion. Color can be applied to the surface in the form of enamel or lacquer and an endless variety of plated and chemical treatments can be used, but these being on the surface only, are subject to deterioration. Finishes, of course, never can give the die casting transparency or translucency. Die castings, especially the zinc alloy type which is the least expensive and the most widely used, are from two to several times as strong as plastics, and in general are tougher or less brittle. They can be made into thinner and more complex forms than is feasible with plastics. Other differences exist, but they need not be considered here, except to emphasize that the finishing of die castings, particularly for exposed applications, is somewhat expensive, frequently costing as much as or more than the casting itself. Die castings may be produced more rapidly than plastic parts and the material costs are lower on a pound basis (around 7 cents for zinc alloys), but in general the plastic part weighs about one sixth as much as the same piece with the same section thickness in a die casting.

With such facts in mind, it is apparent that die castings, which excel in strength and plastics which excel in appearance, might well be combined into units which are made stronger by using a die casting, say for a core, and a plastic for a surface imparting beauty. Such combinations are used today and promise much wider use in the future, as will shortly appear.

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1. Control hardware on Ford cars is covered with rose taupe pyroxylin to obtain uniform color and improved appearance over plain die castings. Knobs are gray acetate. 2. Automobile hardware from Australia. Cut-away section shows metal core with injection molded covering of acetate. 3. Interior automobile hardware showing die-cast parts with resinoid knobs, escutcheons and lenses

A case in point is found in Ford automobile hardware, including interior door handles and window-regulator cranks and butterflies. Such parts have long been die cast and plated and nearly all are so made today, using zinc alloys. Ford engineers and designers sought a "softer" appearing finish on its hardware, one in better harmony with interiors. Enamel would give the color desired but might ultimately chip or wear off. Aluminum die castings, which can be beautifully colored by an anodic treatment, were tried. This treatment gives a very hard and enduring finish which is really a part of the metal and does not chip, but it proved difficult to maintain a uniform shade and aluminum die castings are more expensive and not as strong as the zinc type.

Finally, the Macoid Corporation developed a plastic coating of the pyroxylin (nitro-cellulose) type. This is not a lacquer, which would normally give a coating only a fraction of a thousandth of an inch in thickness, but a complete envelope, five thousandths of an inch or more in thickness, which shrinks tightly

* AUTHOR OF "DIE CASTINGS"

around the surface of the die-cast zinc core and provides the rose taupe color desired. This coating is applied by dipping, in a patented process, and is reported highly enduring, very strong and resistant to wear and capable of withstanding sudden changes in temperature, from 150 deg. F. down to minus 15 deg. F., for example. Thus the die casting gives the required strength, which a plastic alone would not have, but the plastic covering supplies the beauty which metal alone lacks.

The possibilities of applying a similar coating of cellulose acetate to automobile hardware and to other die-cast parts, using the injection molding method has long been recognized as promising, but, so far as the writer is aware, has not been developed commercially in this country. At the recent Chemical Exposition, however, several window regulator handles of foreign make were shown with die-cast cores and injection-molded coatings possessing all the natural beauty of cellulose plastic.

When this process becomes commercial, it should open wide possibilities for combinations of die castings and plastics of all types. It will then be necessary merely to make the die castings used for cores a little smaller than the finished piece is to be, clamp it in the mold and inject the charge of plastic around it.

Such methods, however, are far from being the only ones in which die castings can be and are combined, both for utility and beauty. We find such combinations in several automobile fittings, including window regulators and other controls with plastic knobs. Some of the knobs are injection-molded and some are molded in the common way, often with metal inserts. Still others are turned from bar stock of cast resins. Molded knobs are made of both phenolics and ureas as well as cellulose plastics and sometimes have raised or debossed letters to indicate their function.

Steering wheels are other automobile elements in which die castings and molded parts are combined. Until a year or two ago, most steering wheels included a steel spider on which a rubber rim was molded, the hub assembly usually including some die cast and/or molded parts such as horn buttons and spark and throttle controls. Rubber rims were usually black and sometimes contained pigments which in time were so affected as to soil hands and gloves. More recently where rubber is used, it is given a coating of phenolic resin colored to harmonize with interiors and never rubs off. Flexible steel spokes are now common and these are frequently held together by die castings at the hub and are molded into the rims of plastic material.

In instrument panels, plastics and die castings are again combined. Cadillac, for example, has the entire instrument panel die cast, and the glove compartment door; but knobs have plastic handles. Hudson and some other cars have instrument dials molded from translucent ivory plastics with a metal bezel of chromium plate. In general, the instrument panel is steel with a wood-grain finish to match garnish moldings

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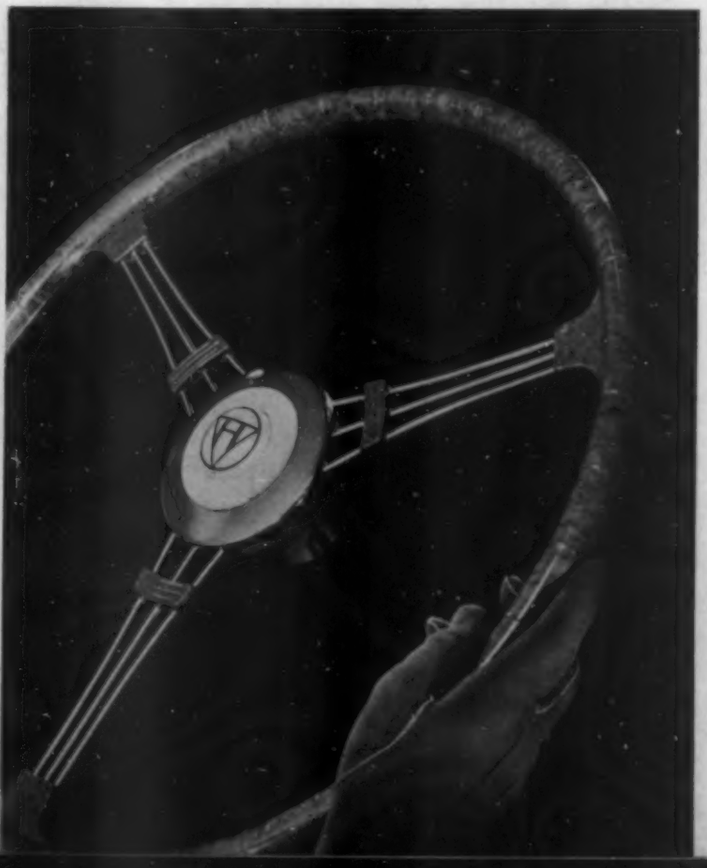


4. This group of knobs indicates the extent to which plastics are used on today's cars. Some molded, some machined, of acetate. 5. A clean wheel is the hope of every driver. This one of plastics on the Hudson cars approaches perfection

and glove compartment doors are of the same material. Cigar lighters are often of cast phenolic with a transparent plastic lens or a translucent body which makes it possible to see when the heating element glows and is ready for use. Dome and quarter lights often have translucent urea lenses, which are much less fragile than glass and more safe to ship.

Radio control units designed (*Continued on page 62*)

PLASKON

FOR MAY 1936

SOCKETS AND SWITCHES:

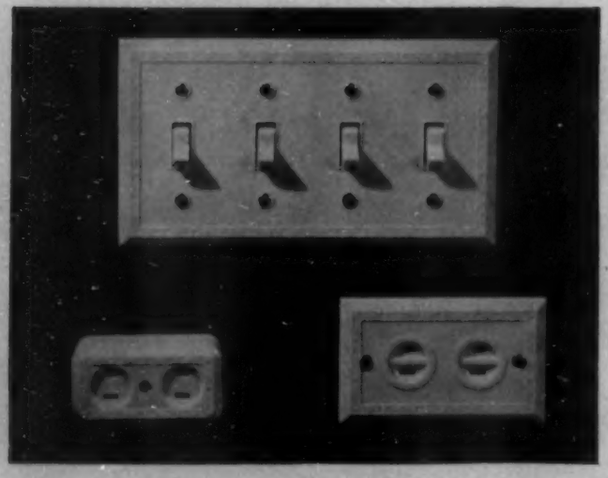
Plaskon switches and wall plates of course have the high dielectric strength you would expect of a material widely used for electrical devices. There is always extra safeguard with Molded Color, but there are equally potent reasons for the thousands of Plaskon parts being molded this and every other day at Leviton Manufacturing Company in Brooklyn, New York . . . reasons that are causing this large concern to switch to Plaskon for many electrical items just as fast as dies are produced for molding them.

The soft color . . . easily cleaned color . . . permanent color of Plaskon is one. The exemplary behavior of Plaskon during and after the molding operation is another. The minimum percentage of rejects is the third. The greater dimensional accuracy of Molded Color switches and wall plates, as compared with the former standard porcelain parts, is the fourth. And the popularity of Plaskon parts with wholesalers, jobbers, and the ultimate customer is the clinching fifth reason.

At the present time the complete line of wall plates and switches is molded in ivory, in designs created by the Leviton staff. Ivory is the color best in tune, generally, with modern decoration.

Directly below are four of the screw and plug sockets which are Leviton products and Molded Color products, too. The ease of assembly in production of the plastic and metal parts, and the fact that all cut aways are taken care of in the molding are advantages in all such work.

Write today (telling us what you make) to Plaskon Company, Inc., 2121 Sylvan Avenue, Ohio for specific electrical information.

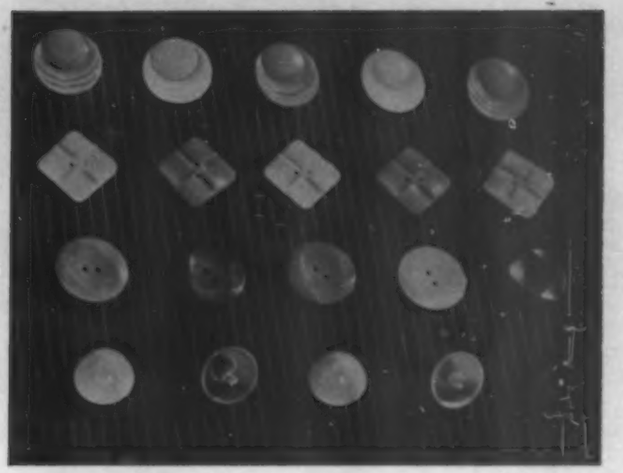


JEWELRY BOXES:

Since the jewelry people have been won away from plush and satin, and won over to smooth, colorful plastic cases, Molded Color has become companion piece for diamonds and other gems of purest ray serene. Norton Laboratories, Inc., of Lockport, N.Y., recently supplied three Buffalo jewelry houses with three complete lines of cases, in Plaskon.

Where velvet and cloth covered boxes in store windows are affected considerably by light, Plaskon boxes are guaranteed light-fast. Their lovely color is permanent. You can appreciate, too (jewelers do) how much more easily the smooth Molded Color boxes are kept clean. And how, being light in weight, Plaskon boxes reduce shipping costs.

For packaging—whether it be jewelry or jam —Plaskon is the choice. Its leading position in jewelry packaging is again illustrated in these Wolfsheim & Sachs cases. Other above-mentioned companies: Warner Jewelry and Buffalo Jewelry Case.



BUTTONS:

Once again woman is aping the male (attire), and the button people are rubbing their hands in glee. Masculine suit and shirt waist styles, twin sweater sets and the new summer clothes are rocketing the demand for buttons way above the 571,000,000 needed in 1935.

Plaskon has been, since 1932, and is today an odds-on favored button material. One outlet alone sold 52,000,000 Molded Color buttons last year.

Men notice buttons only when they are missing but women rightfully regard them as an important decorative item. Aware of this, clothing people specify Plaskon buttons for their strength and color beauty. No amount of Monday's washings and Tuesday's pressings affect color-fast Plaskon. With Molded Color's infinite color range to work from, designers are using more buttons and instilling need for them in every woman's mind.

Molded by Auburn Button Co., Colt's Patent Fire Arms Co. and Consolidated Molded Products.

MOLDED COLOR

PLASKON COMPANY

INCORPORATED

2121 SYLVAN AVENUE, TOLEDO, OHIO

CANADIAN AGENT: CANADIAN INDUSTRIES LIMITED, MONTREAL

developments of the month

1

1. A cone-shaped cup of Durez acid-resisting material is fitted into the neck of every bottle of Rite-Well ink. To fill the cup to the proper level for fountain-pen filling it is necessary only to invert the bottle and turn it back quickly. Thus the barrel and threads of the pen are not smeared with ink. A hollow-top cap permits the proper amount of ink to run into the cup. Featured by the C. W. Smith Co.

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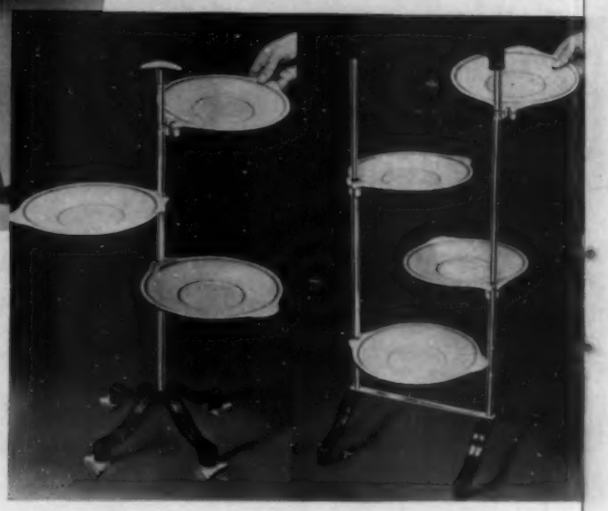
2. The keen-edged dissecting knife shown in the illustration is intended primarily for laboratory use. It has a number of diversified uses, however—one of which, we discovered, was letter-opening. It is exceedingly light in weight and has a knurled molded black handle which affords a firm grip even when wet. Molded by the Northern Industrial Chemical Co. for the Clay-Adams Co.



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3. Cook & Morum, British molders, have adapted the idea of their swing stack letter file trays to the unique cake stands pictured here. Top handles and feet have been added to the chrominum-plated columns, and either single rod or double rod models may be obtained.

4. Graphic Lamacoid, developed by Mica Insulator Co. is a product which incorporates designs, colors, printed matter, diagrams and reproductions into translucent or opaque sheets of Bakelite laminated. It may be employed for signs, window displays, radio dials, charts, instruction cards, maps and graphs of all kinds. A variety of sizes and thicknesses are available.

5. The Wollensak biascope sport glasses are smooth and non-slippery with powerful lenses. The one on the right weighs only about 4¾ ounces, about as much as half a dozen business letters, and fits easily into the side-pocket. Molded of Durez for the Wollensak Optical Co.

6. This counter sampling unit created by Reta Terrell simplifies the selection of perfume. Four vials contain various scents arranged in a flesh-colored base of Bakelite cast resinoid which has been hollowed out so that the bottles fit snugly and will not tip over. Lipstick and rouge are packaged in containers of the same color cast resinoid.

7. Here is an attractive shaving stick case of Plaskon and Durez made by Colt Patent Firearms Co. The screw-on top which is extremely light in weight comes in a variety of brilliant shades, and the base is a light color, approaching ivory.

8. The business end of this Rush-Eraser is composed of tiny fibres so fine that the eye can hardly see them, yet they are flexible and hard as steel. The erasing surface of the brush is sufficiently narrow to permit a single letter to be removed without the use of an eraser shield. A refill case (shown with the eraser) and the eraser casing are of molded phenolic, made by the Niagara Insul-Bake Specialty Co., Inc., for the Eraser Co., Inc.

9. Thirty pictures with only one loading may be taken with candid camera, the "Argus—Model A" which has precision adjustments for diaphragm openings and shutter speeds, and utilizes a 35 mm. motion picture film. It comes from the International Research Corporation and is Bakelite molded with a metal back.

10. Opening corrugated and fibre shipping boxes and containers becomes a simple process with this economical device which will slit cartons on either the side or top. All adjustments are made by one screw and the blade can be arranged to cut any desired depth. The Bakelite molded case is built sectionally to provide space for a razor blade which does the cutting. Offered by the Safeway Co.

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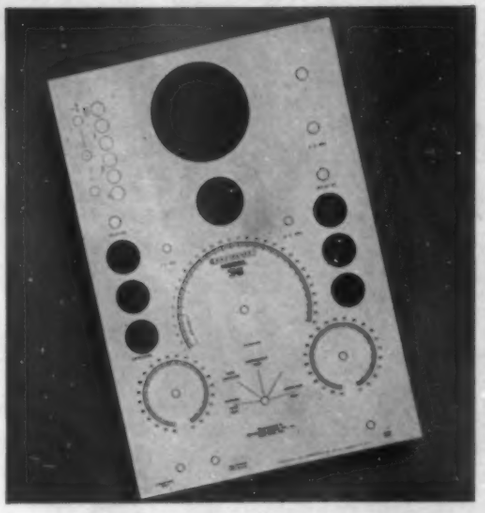

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Modern merchandising

BY A. Q. MAISEL

The story of a common everyday convenience which was molded with planned economy and merchandised with tremendous success. The Nite-Lite with its molded-in switch is shown at the left. Its merchandising display card in gay colors appears below

GREAT sale-successes are often easily explained after they have been accomplished. Clever merchandising stunts, subtle advertising plans, ingenious and complicated inventions, all these tend to win recognition and acclaim far out of proportion to the profits which they usually develop. But the simple things, the things anyone else might have done if they hadn't overlooked the opportunity, are all too often accepted without comment or ignored without sufficient study.

Particularly is this true, and regrettably so, in the plastic molding field. Startling new plastics and ingenious new devices tend to obscure the simpler opportunities that involve only the logical application of tried and proven plastic molding principles. For this reason, the experience of the Marks Products Company should be of particular interest to users and potential users of plastics. This concern, by a clever combination of tried ideas, has within the last year performed the extremely unusual accomplishment of winning in excess of a million sales in a field where million-a-year sales records are seldom heard of.

The Marks Products Company, a subsidiary of the Cable Electric Company, was originally engaged in the manufacture of radio tubes and other radio equipment. A few years ago, when it decided to withdraw from this field for various reasons, it found itself with a plant completely equipped for the production of electrical accessories and a sales staff with a good reputation and sound contacts among firms handling such items.

It naturally turned, therefore, to producing appliance plug-and-cord sets, switch cord sets, plugs and three-way-taps—in short, a line of standard electrical accessories, the staple electrical items sold in every chain store, hardware store and drug store.

The firm built its strong selling-policy around a series of colorful merchandise display units, which served to demonstrate the entire line and to keep it in full public view at all times. The company also took advantage of new plastic opportunities as they arose, having been among the first in its field to adopt bright-colored plastics and to feature these in its dealer sales-promotion and its merchandise display units. Its moldings, like its other parts, were distinguished by sound engineering and good design—but, beyond a justifiable claim of quality and sound merchandising backing given to dealers, no pretense was made toward the production of anything but a staple line of accessories.

Then, about a year and a half ago, plans began to be formed for the production of a small, self contained, night-light unit, that would be economical to operate, extremely low in cost, sturdy, simple and fool-proof. As the project developed from idea to plan to finished "Snapit Nite-Lite," it was found to center around two comparatively simple plastic moldings—one to hold both the plug prongs and the switch, the other to shade the light and shield the bulb. Examine it in the illustration. Perhaps the first thought that will occur is that there is nothing unusual about it. And that, while true, is its most unusual feature!

For this "triumph of the obvious" is something that plastics had made possible ten or fifteen years ago—

something that should have been done but never was—until this company did it. Obviously, the base molding is closely parallel to the moldings of any plug or socket. It involves no basically new principles, although it does involve an unusual combination of equipment within a small space. Nor is the shield molding an item that might not have been done long before. Yet, in combination, these two parts, a switch and a bulb, tapped an extremely wealthy and uninvaded market which produced immediate results.

Snapit displays containing electrical accessories provide a complete compact merchandising card attractive and easy to handle

This combination could be marketed in brown phenolics at a retail price of twenty-five cents—bulb included. And, in green or rose or ivory, it could retail profitably at thirty-nine cents. Any previous combination of similar parts—had they existed—would have cost at least twenty per cent more if bought as separate units. Place such an idea before the public, even in last year's uncertain markets—as the Marks Company did—and you are reasonably sure of winning large sales. Place it in cleverly designed displays that point out its application, stress its usefulness, safety and economy, feature its low price—and the prospect of selling a million such Nite-Lites (one for every tenth electrified home) within a single year comes nearer to being a reality than a probability.

But to sell a million of anything in these days, price must be right, which in terms of a million sales means low. In turn, low price requires that every part be designed for automatic production and every non-essential be eliminated. Here again, and particularly in the plastic parts, the Snapit Nite-Lite is a logical "Exhibit A."

First of all the designing engineers saw to it that the knife plug and the switch were combined within a single molded shell that likewise holds the small-sized socket. To achieve this, it was necessary to employ a four-part mold, consisting of two sections, working into either end of the inside cavity of the finished piece, and two others forming either side of the outside surface. By this means, the complete outside shell including a hole for the switch-arm and a groove for the shade were molded in a single operation simultaneously with the inner supports for the switch and the knife-prongs.

At the same time, provision was made for the molding in, as an insert, of the (*Continued on page 60*)

Three-section cigaret dispenser with black Makalot tambours and chromium trim. The tambours are molded integrally with their canvas backing and cannot become loosened in use. See other applications on opposite page

Molded tambours that stay put

INDIANS used to build fences this way. Small trees were bound closely together with green twigs and then set in the ground. Even today, decorative fences are fashioned in much the same manner except that the thin cedar strips are usually made in half-rounds and stitched together with wire. Because such construction makes the finished product flexible, the idea has been borrowed frequently to appear in various utilitarian roles where flexibility is greatly desired.

Along about 1800, desks with sliding tambours began to appear. The tambours were made by gluing thin flexible half-round strips of mahogany or other woods to canvas. These tambours were set in grooves and could be pulled open or closed by simply sliding along the grooves in which they were set. They were sufficiently flexible to turn sharply at the corner so that when the tambour was open, it was completely unseen. They were usually installed in pairs, in a vertical position, and when the desk was to be closed, they were pulled together to meet in the middle.

Perhaps the most popular appearance of tambours was in the roll-top desk of the nineteenth century. Here the strips were much larger and were installed horizontally to roll up and down rather than to slide sidewise like their predecessors. The construction was rugged and their practical use in desk manufacture became almost universal. The size of the strips, of which the tambours were made, gave sufficient gluing surface to make them adhere readily and very little difficulty was experienced through their failure to stick during the lifetime of the desk.

It may seem strange that an idea so old can be brought down to date and be made to fit in so perfectly with modern design, yet such is the case. Cigaret cases appeared a few years ago and became exceedingly popular. The tambours, which were made of wood, were almost identical in construction and appearance with those used on the first tambour desks. Natural grainings with polished surfaces were happily combined with gold and silver colored metals in pleasing effects suitable to that period.

Modern designs demand modern materials, however, and color became a matter of paramount importance in nearly all decorative accessories. To meet

this demand, tambours were made of plastic materials of which color was an integral part—then trouble began. The tiny strips had an exceedingly narrow gluing surface and lacked the porosity of wood, and while some progress was made in the development, difficulty was experienced in getting the strips to adhere to the canvas for any length of time. Moisture would get into the backing, or some liquid would be spilled on the case, and the strips would let go.

The Roll Case Manufacturing Co. had had a taste of the popularity of this type of cigaret case and refused to believe that this difficulty could not be overcome. They enlisted the combined cooperation of the Royal Molding Co., who did their molding, and the Makalot Corporation, makers of the special plastic material from which their cases are made. The result is a complete line of cigaret cases of pocket, desk and table proportions with never a fear that the strips will separate from the canvas on which they roll.

The flexible canvas is impregnated with a resin which retains its flexibility yet becomes integral with the plastic strips in the molding operation. No solvent which will not affect the outside of the case can cause the strips to become loosened from their backing. Water, alcohol, or other liquids with which such a case might come in contact in its daily use will not harm it in any way.

The tambours, or escalator rolls, as the manufacturer has termed his modern construction, are extremely flexible and roll back and forth with perfect freedom and ease. They fit snugly into their chromium finished frames and are altogether pleasing in appearance and eminently satisfactory in use.

In discussing the possibilities of tambour molding with T. P. MacNicholas, general manager of the Royal Molding Co., it develops that he has a number of items in mind which he believes can be successfully made from this new material. He believes there are many opportunities for the material in the packaging field where reuse boxes have gained much popularity in recent years. Glove compartment doors in automobiles and similar openings in household cabinets are within the range of practical usages.

Lamp shades are well within the range of practical possibilities. They could be made of light translucent colors and shaped much the same as parchment paper shades are made today. The fact that the material can be made in any width and length, once the simple mold is made, makes its manufacture comparatively inexpensive. The mold can be made by a rather simple process of machining and need not be prohibitive in cost—even in the larger sizes which would be required for such applications as shades. The amount of plastics material required for a sheet of considerable size is small. The strips being used at the present time are spaced nine to the inch although there are no restrictions other than the mold cost to prevent them from being made in any widths desired. Wider strips, however, might not present such a neat appearance and would be more likely to appear as though they were made of hard rubber or wood. Narrower strips would perhaps not stand the constant service to which they are subjected in such items as a pocket cigaret case. The advantage of using plastics is obvious. The natural luster is as permanent as the molding itself and doesn't have to be applied. Color is an integral part of the molding itself, and since it goes all the way through, it cannot come off nor show signs of wear after a short period of service. And the range of colors is almost without limit.

Thus we see a revival of the tambours of the early eighteenth century brought down to date in modern materials not dreamed of in those early days. And we see another problem of the molding industry solved by the ingenuity and materials of nineteen-thirty-six.

Chemical dip polishing

BY EDWARD F. ZEPP

THE old procedure of polishing casein particles by means of chloride of lime and adding sal soda for converting to the sodium salt, has been long since abandoned. This is in all probability due to the ill effects obtained from handling chloride of lime, especially in the warm summer months.

Chemical dip solutions already prepared for use in polishing casein, ronyx (a product similar to casein in its reaction with the chemical dip), and phenolic resinous products, etc., have very largely replaced the old solutions above mentioned. These more recently developed solutions have been found to be less hazardous in handling and decidedly more economical, as well as producing a better finish on synthetic plastics which do not contain fillers, such as woodflour, diatomite, or other inert materials.

Considerable research and time have been spent in developing a polish of this nature to give optimum results under certain temperatures and concentrations. Stability of such a solution is of paramount importance because of the necessity of obtaining absolute uniform results in the finished polish.

Research has proven conclusively that when such a solution contains even traces of iron or manganese, these impurities have a tendency to act as catalysts causing rapid deterioration of the solution, resulting in loss of chlorine. This is then commonly called an "unbalanced" solution. The removal of traces of either iron or manganese is not a very simple matter, but requires the best technical skill, obtained only through years of research and practical experience.

Many button and novelty fabricators frequently obtain non-uniform results in their polishing operations. They usually attribute this to the stock not being uniform (casein or other synthetic plastics), whereas the cause often can be traced directly to the decomposition of the chemical dip solution; hence the importance of a perfectly stable product at all times of the year.

Optimum results are usually obtained if the following rules are observed:

1. Proper tumbling or "ashing" prior to chemical dip polishing (the removal of all heavy tool marks, and rough edges, etc.).

2. Excessive amounts of pumice should be eliminated from the particles (action of polish faster and more effective).

3. Equipment properly designed to facilitate and speed up polishing operations (batches). R. p. m. and degree of slope of polishing bath important. Type of container to prevent polish decomposition highly important in this process.

4. Time of immersion (dip) and temperature are most important to prevent "orange peel" and obtain smoothness of gloss finish. Excessive temperatures and time ought to be avoided. High concentration of polish solution should be also avoided.

5. After-treatment of particles to prevent "sticking or marking" is desirable, prior to drying operation.

6. White casein should be polished by specially prepared polish for this material exclusively.

7. Type and name of resin to be polished ought to be specified by fabricator, in order that the polish manufacturer might supply the correct polish, for the respective resin. (Formopol for phenolic resinous products, Lactopol for ronyx, modified for white caseins and regular button for colored casein products.)

8. Rate and temperature of drying are important (due to hygroscopic characteristics of synthetic resins), because of the tendency of "spawling" when dried too rapidly or by excessive heat.

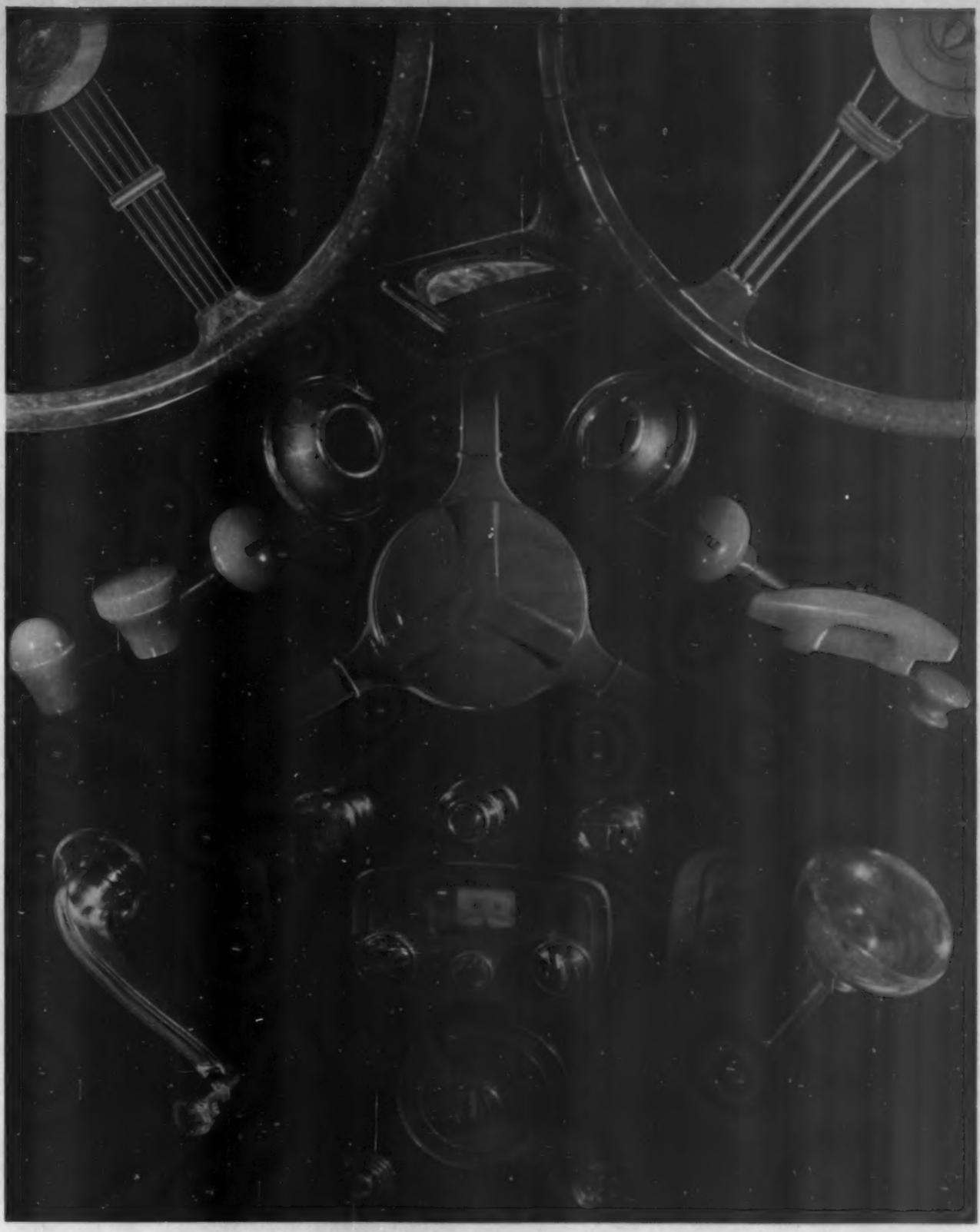
9. Two dips are usually preferred by the average fabricator and when properly done, the finish is almost equivalent to that of hand buffing. Cost of polishing operation is almost negligible per gross, due to polish being diluted to a low concentration prior to use.

The advantage in the use of such chemical dip polishes is that they are not inflammable. On the contrary the solution can be used for extinguishing a fire. It is an aqueous solution, and the vapors are wholesome in that it is a germicidal.

Polishing rooms should be supplied with concrete floors, and not wood, due to the corrosive effect of chemical solutions in the polishing operations.

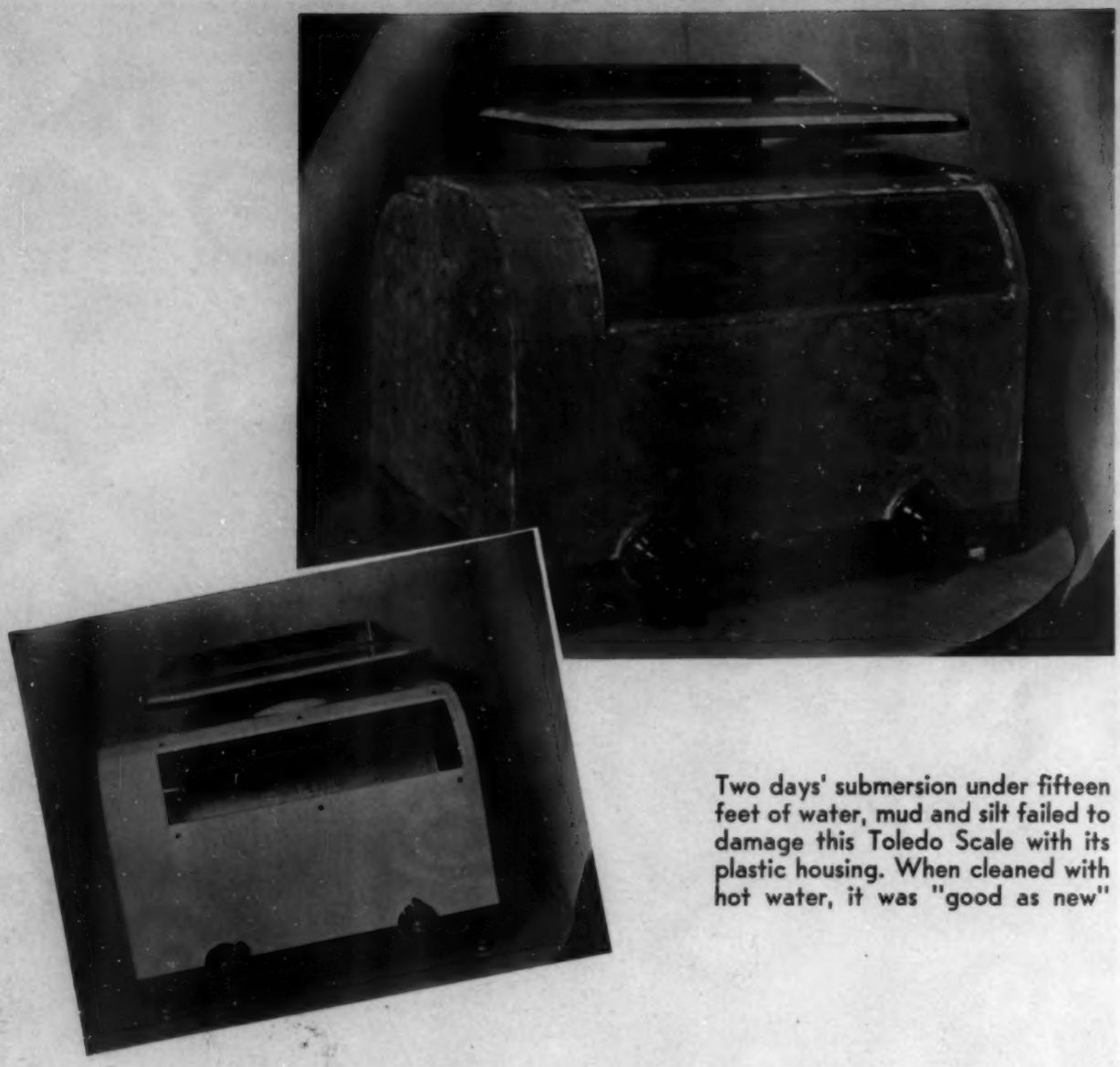
Champions of 1936

The champion soft-ball team of the Auburn Button Works, Inc., winners of the championship in the Industrial League for both 1934 and 1935 send out a challenge to any raw material, or molding company to a game or series of games in soft-ball, dates to be decided at the convenience of both participants. Players are non-professional and selected from regular employees. Shown above (in the photograph) is the Auburn Button Works basketball team which has just successfully concluded its 1935-36 season as champions of the Industrial League.



TWENTY-SIX MOTOR CARS USE TENITE... for interior appointments, including such parts as steering wheels, dash controls, horn buttons, ash tray and window-regulator handles, and gear shift knobs. The exceptionally high strength and beautiful coloring of Tenite which led to its choice by the motor car industry also make it the ideal plastic for many other industrial and decorative uses. Write today for a new 52-page illustrated book and samples of Tenite.

TENNESSEE EASTMAN CORPORATION *(Subsidiary of Eastman Kodak Co.),* **KINGSPORT, TENN.**



Two days' submersion under fifteen feet of water, mud and silt failed to damage this Toledo Scale with its plastic housing. When cleaned with hot water, it was "good as new"

Even Noah had a boat!

RECENT floods wrought much havoc and destroyed millions of dollars' worth of property in many parts of the country, but this Toledo Scale with its molded plastic housing came through as good as new. For two days, it was completely submerged under fifteen feet of water in a butcher shop at Pittsburgh, and when the waters receded sufficiently to enter the store, the scale was found buried in more than four feet of river silt and mud. When it was dug out of the mess, a stream of hot water was played upon it, inside and outside, with a hose; then it was wiped dry with a cloth and restored to its original condition as you see it here. There was no warp or distortion at any point of the molded housing and even the aluminum chart on which the demarcations of price and weight are engraved was intact. No permanent damage was apparent.

Other scales didn't fare as well. Those with paper charts, which were more or less universally used prior to the development of this modern scale, were naturally ruined. Two days submersion gave rust a chance to do its damage. Delicate mechanisms essential to the accuracy of any scale suffered accordingly.

Floods probably were not seriously considered when this scale was designed but this experience cannot but focus attention on the advantages of rustless mechanisms and housings for business machines of every sort. Floods are not the only damage they may eventually face; a broken sprinkler-head can do almost equal damage and is much more likely to occur than floods in any locality. Such protection is worth considering.

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CATALIN can be cut as readily as brass or wood

CATALIN for parts of irregular contour are shaped on a standard turning lathe

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•

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Quality CATALIN products. Featuring items such as jewelry, novelties, cigarette cases, clock housings, toilet articles, handles of various description, silverware and similar items. Modern plant and equipment enable us to turn out the very finest workmanship.

•

KREST MANUFACTURING CO.
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Specialists in beer and soda fountain dispenser balls and fittings, also gear shift knobs, hardware items, razor handles, radio parts and similar products in large quantities.

•

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We make a specialty of packaging items for cosmetic products such as powder and rouge boxes, compacts, decorative bottle tops as well as containers suitable for displaying such products as jewelry, hosiery, stationery and similar items.

Industrial applications where accurate dimensions and close supervision are important receive our careful attention.

CATALIN is furnished by us only as raw material in the form of rods, sheets, tubes and special castings. We do not manufacture finished products and for your convenience, offer herewith a partial list of authorized CATALIN fabricators.

Should you desire any special information on manufacturing problems, our Engineering Department will be glad to cooperate with you and, if required, recommend fabricators in your locality who are suitably equipped to do your work.

For your convenience, we maintain at our New York office a stock room and fully equipped sample department.

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Your requirements for commercially accurate CATALIN products or parts can successfully be entrusted to us.

New and modern equipment enables us to supply fabricated pieces to exacting specifications. We manufacture for such firms as International Silver Company, Scovill Manufacturing Company, Continental Silver Company and many others.

CATALIN knobs, balls or other ornamental trimmings in beautiful colors will improve your products and build up additional consumer appeal.

Our industrial designers and our modern facilities are at your disposal.

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•

H. KREUL COMPANY
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Specialists in fabricated CATALIN products for the automobile trade, radiator ornaments, knobs, handles, fittings of all types. Equipped to do quality and quantity production work.

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Fabricators of millinery, dress and shoe ornaments, display fixtures of various types, also desk sets. We specialize in the carving of CATALIN and the fabrication of sheet material.

•

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For fabricated parts of CATALIN of all types and description, come to "Turner." Our equipment is of such diversified nature as to enable us to take prompt care of your inquiries.

Your inquiries are solicited.

AMERICAN CATALIN CORPORATION

ONE PARK AVENUE, NEW YORK

NEW IDEAS

● Waterproof matches, so much desired by campers, hunters, fishermen and others engaged in outdoor activities, are offered by the Swedish match industry in a new match head employing a synthetic resin as the binder for the flammable composition of the head. The match head composition is made up with a suitable proportion of a synthetic resin of the hardenable type, the heads are applied to the sticks, and the resinous binder is hardened. (L. E. Larsson, Jönköping, Sweden, Holland Patent Application 67,503.)

● Metallized insulating windings for electric cables are made in a form which is perfectly non-hygroscopic, and has small dielectric loss with a dielectric constant which is independent of frequency; this is accomplished by plasticizing a polystyrene resin with tricresylphosphate to make it sufficiently flexible, then spraying on a coating of lead, tin or aluminum. Cables with this type of winding are both durable and electrically efficient. (Ernst Fischer, Siemens and Halske Co., Berlin, Austrian Patent 143,239.)

● The quenching chamber of electric switches having an arc quenching arrangement are made of heat resisting, steam resisting molded material consisting of cotton, silk or rayon impregnated with synthetic resins and molded under pressure. Neither the arc nor the quenching steam affects this material, so that the quenching chamber has excellent durability. (Siemens-Schuckertwerke A.-G., French Patent 785,832.)

● Instead of dyeing phenolic resins with organic dies when colored plastics are to be produced, colloidal inorganic pigments are dispersed throughout the plastic material. This has the advantages of heat stability and color fastness, coupled also with economy in making colored articles. For black the colloidal pigment is about 1% of silver nitrate (calculated on the resin); decomposition to form colloidal silver gives the black color. For red a sulfide of sodium and antimony may be used. (V. D. Otzing, Russian Patent 43,155.)

● A transparent resin for making molded articles which have exceptionally good mechanical properties is made by mildly acid condensation of phenol with formaldehyde, followed by a quite strongly acid treatment to effect dehydration and polymerization of the initial condensation product. Molded shapes made from this type of resin have unusual resistance to warping and crazing. They are also characterized by excellent hardness, toughness, insolubility and infusibility. (Geo. H. Wilder, Du Pont Viscoloid Co., Wilmington, Del., U. S. Patent 2,035,515.)

● Magnetic cores with remarkably good mechanical strength and heat resistance are made of iron dust and a synthetic resin binder which may be a polystyrene, polyacrylate or mixed polystyrene and polyacrylate resin. A large proportion of iron dust is used, with sufficient of the resin to serve as a binder. The powder and resin are mixed in a masticating machine, and the cores are shaped by an extrusion machine which may be adapted either for making rods or tubes. (I. G. Farbenindustrie A.-G., Frankfurt, Germany, French Patent 787,557.)

● A new porous material which is especially useful for heat insulation (e. g. in refrigerators or the like) or for soundproofing halls, auditoriums, etc., is made by mixing polystyrene with a suitable blowing agent such as ammonium carbonate or methylene chloride, heating the mixture to the required temperature and then subjecting it to a high vacuum. (Dynamit Aktiengesellschaft vormals Alfred Nobel & Co., Austrian Patents 140,584 and 142,254.)

● Buttons and similar shaped articles are made in mottled effects from molding powders by forming layers of plastic in different colors, then cutting and stamping the layers in such a way as to give variegated effects running through the buttons from top to bottom. (Kurt Gullich, Bisonit G. m. b. H., Marienberg, Germany, French Patent 789,198 and British Patent 435,794.)

● As the art of injection molding advances, the range of manufactured articles is constantly becoming wider. Some recent offerings of German molders include an ointment dispenser with screw cap, a novelty jewel (or dressing table) box, a set of holders for dental drill tips, a variety of new designs in screw cap closures, an ink well with cap, a typewriter ribbon container, an eraser holder, containers for pencil leads, lipstick holders, jars for cosmetics, and a number of items for pharmacists. Marble, tortoise shell and other mottled effects are used to obtain excellent ornamental designs which add variety to the wide range of solid colors now available. (Kunststoffe, March, pp. 65-67.)

● Cellulose ester plastics are used to make containers in odd shapes, following a new technique which was recently described by Dr. Brating in a lecture before the *Verein Deutscher Ingenieure* (German Engineering Society). The new method does away with the use of any adhesive, and permits the production of hollow articles (e. g. containers) having a variable cross section. The cellulose ester solution is deposited on a form, and after being stripped from the form is given a special treatment to prevent absorption of water by the container walls. (Revue Generale des Matieres Plastiques, Feb., p. 47.)

● Resins of the "Thiokol" type, which were developed on the basis of a reaction between polysulfides and olefin dichlorides, are now also successfully made from polysulfides and ether dichlorides. This adds to the range of useful properties which can be had in "Thiokol" resins. The strong sulfide odor of the initial reaction product can be eliminated by careful washing. In addition to good elasticity the new products have remarkable resistance to chemical attack, which makes them useful in many ways such as for lining containers or other apparatus which is exposed to the action of chemicals. (J. C. Patrick, French Patent 789,743.)

Backstage

WHITING N. SHEPARD, author of the article "Stoves, too, sell on appearance" on page 20, is affiliated with the sales department of the Plaskon Co., Inc., whose light-colored materials, developed during the last few years, have made decorative stove attachments possible.

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JACK DELMONTE, who wrote "Light and safe for aircraft" which appears on page 15, was born and educated in New York City. His interests in plastics arise from a hobby in chemistry and material tests which he makes at a government laboratory where he works as an engineer.

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VINCENT D. HERY, whose comprehensive answer to the question "What is this injection molding?" appears on page 22, has done much, in his capacity as a specialist with the Index Machinery Corporation, to promote injection molding in order to utilize the numerous possibilities of thermo-plastic materials.

EDWARD F. ZEPP, who wrote the article "Chemical dip polishing" on page 38, has had broad and diversified experience as a chemical engineer. At present he is sales engineer for the Kuehne Chemical Co., introducing chemical dip polishes to the industrial trade fabricating synthetic resinous plastics.

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HERBERT CHASE, who wrote "Plastics and die castings combined" on page 28, is well known to our readers. He is an engineer by profession, but at present spends most of his time travelling around the country writing on a free lance basis—ideal sort of life, we call it, and an enviable one.

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JEAN MAYER, whose stories have appeared in this magazine frequently in the past, this month offers "In tune with economy" on page 17. Miss Mayer was formerly associated with MODERN PLASTICS as an assistant editor and is now developing her flair for writing fabricating and merchandising stories as a free lance.

Backstage

More fun at Shawnee

A national golfing meeting and tournament, under the direction of Gordon Brown, of the Bakelite Corporation is now being arranged to be held in Shawnee, (Delaware Water Gap), Monday May 25th. It is open to all members of the plastics and molding industry, and acceptances have been received all the way from Chicago to New England. According to tentative plans, there will be a golfing tournament winding up with a dinner and get-together Monday evening and golfing will continue Tuesday, so that out-of-town participants may arrange to stay overnight. Reservations should be made promptly.

Golfing molders will also be interested in a recent announcement by the British Plastic Molders Golfing Society to the effect that it will be glad to make honorary members of any American molders who may have occasion to visit England. Anyone contemplating such a trip should contact Gordon Brown to be assured of this courtesy.

Ellis talks to A.S.T.M.

Finished products and the numerous applications of the various resinous plastics were shown and explained in the lantern slide talk on "The Chemistry of Synthetic Resins' given by Carleton Ellis to the members of the American Society for Testing Materials held at the Hotel New Yorker recently. Over six hundred members were present. Mr. Ellis, who is a scientific investigator, inventor, and author in the fields of petroleum and synthetic resins discussed all of the materials of this classification from phenol and cast resins to synthetic rubber compositions and safety glass. Three members of his laboratory were in attendance at the exhibit of plastic products set up for the members of the A. S. T. M.

An effort is being made to arouse sufficient interest in the wide-spread possibilities of plastics to establish a permanent testing committee in the field. Up to the present, Insulating Material Committee D-9 is the only one to have done any work in this direction.

Cutler-Hammer opens new office

Cutler-Hammer, Inc., manufacturers of electric control apparatus, announce the opening of a new office in Baltimore to provide closer contact and better service facilities to customers in the states of Maryland and Virginia. The new office will be located at 10 W. Chase Street in Baltimore and will operate under the supervision of the Philadelphia district office. The Baltimore office will be in charge of R. A. Haworth, who is capably experienced in the complete line of Cutler-Hammer control apparatus.

Opens N. Y. office

Kuhn & Jacob Moulding & Tool Co. announce the opening of a sales office in New York City, located at 55 West 42nd Street, Room #1141. H. L. Amdury and Andrew Jacob will represent the company there.

H. M. GALEY

E. B. FUNKE

Galey and Funke join Makalot

Homer M. Galey and Edward B. Funke, who for the past seven years have been in charge of the production of molding powders, resins and varnishes at the Reilly Tar & Chemical Co., became identified with the Makalot Corporation on May 1st, as factory manager and assistant, respectively.

Mr. Galey's diversified experience in the plastics industry extends over a number of fields. After graduation from Wabash college, he started work in the Chemical Warfare Service which he continued during and after the World War, with a short interval between when he was employed at the Brown Company in Quebec. In 1923 he went over to the Diamond State Fibre Company where his experience in the paper industry gave him a working background in his efforts to develop laminating varnishes and processes for laminating materials. In 1929 Mr. Galey became affiliated with the International Combustion & Engineering Co. (which was later taken over by the Reilly Tar & Chemical Company) with the purpose of organizing a plant for the manufacture of phenolic resins and molding powders known as "Indur." He remained director of plant production with this firm until he joined the Makalot staff on May 1st.

Edward B. Funke, his assistant, became associated with Mr. Galey in March 1929 after leaving Rensselaer Polytechnic Institute, and for the past seven years has served in that capacity. Mr. Funke has had wide experience in every department of the Indur plant and has also been the technical representative of the company in demonstrating their materials and working out various problems for molders and manufacturers.

Impact strength nearly doubled

General Plastics announces an extra strength Durez molding material which combines machining qualities with higher impact strength, the material being known as 1544. Developed especially for molded parts such as telephone handles, machine parts requiring higher than ordinary strength plus machinability, 1544 combines these qualities in a material which molds on regular cycles and which preforms automatically without difficulty. The impact strength has been increased to almost twice that of regular phenolic materials, and the finished moldings can be machined, sanded, buffed

Backstage

or wire-brushed without uncovering filler spots. Subsequent buffing of the machined areas will bring up a rich black finish of unusual smoothness and lustre. In addition, the material is light in weight, weighing 22.4 gms. per cubic inch.

N. S. Stoddard moves

N. S. Stoddard, advertising and sales promotion contact for the General Electric Company's Plastics Department, has transferred his office from Lynn, Mass., to the Pittsfield (Mass.) Works of the company, it has been announced by Roy E. Coleman, manager.

Williams appointed sales manager

Mr. Harold J. Williams has recently been appointed Eastern Sales Manager for the Index Machinery Corporation. Mr. Williams was formerly connected with General Plastics, Inc., with headquarters in Chicago.

Now representing Thiokol

Thiokol Corporation, Yardville, New Jersey, recently appointed Leo F. Mullen, 2563 Fenwick Road, Cleveland Heights, Ohio, to handle the middle-western sale of the new "Thiokol" synthetic rubber printing plate and plastic molding powders. Mr. Mullen was formerly with Synthane Corporation and The Sherwin-Williams Company.

Glyco moves

The Glyco Products Co., Inc., New York, N. Y. announce that on and after April 25th, their new address will be 148 Lafayette St. (near Canal St.), New York, N. Y., Telephone No. Canal 6-6510. This move has been made in order to consolidate the laboratories, warehouses and executive offices.

Annual meeting

A large number of technical papers and reports are scheduled for presentation during the 1936 annual meeting of the American Society for Testing Materials, to be held in Atlantic City at Chalfonte-Haddon Hall from June 29 to July 3, inclusive. Approximately twenty sessions will meet to provide ample time for presenting the wide variety of papers dealing with many different subjects.

Crowds attend fashion review

A total of 61,996 people attended the fashion review at the Du Pont Exhibit held in Atlantic City recently. The review was presented twice daily, with an additional evening session on Saturday.

Dr. Baekeland honored

Dr. Leo Hendrik Baekeland, president of Bakelite Corporation, and inventor of Bakelite resinoid and Velox photographic paper, has been elected to honorary membership in the Electrochemical Society. This is a signal distinction which only three others hold.

Books of the month

"Thiokol facts"

A rubber "plantation" in New Jersey, latest of modern industrial achievements, is the subject of a readable little leaflet published by the Thiokol Corporation, which made its initial appearance in April. The publication will appear regularly every month and will give specific information on new applications of synthetic rubber. Perhaps one of the most interesting things about this current issue is that the half-tone plates used for printing its illustrations are made of Thiokol, a synthetic rubber material.

Index to testing standards

The latest edition of the Index to American Society for Testing Materials Standards and Tentative Standards gives information on all of the 794 A.S.T.M. standards as of January, 1936. The booklet is of service in ascertaining whether the Society has issued any standard specifications or test methods covering particular engineering materials or subjects and is also of help in locating conveniently any of the standards in the publications where they appear.

Process News

The first issue of the second volume of Process News, published by the F. J. Stokes Machine Co., contains a number of production hints and useful charts and diagrams as well as news and the enumeration of the various types of equipment this company offers. The booklet is informative and well-illustrated.

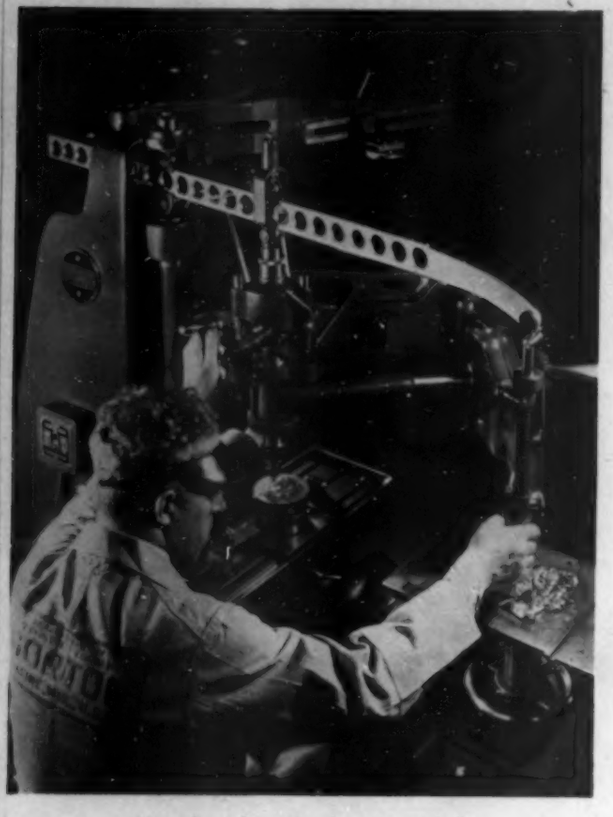
Pantograph

Transferring the peaks and valleys of a bas-relief from an original model to a steel die or mold becomes a comparatively simple operation with proper equipment. Without such equipment, it is a complicated task to say the least. This is equally true of transferring almost any design where the skill of the artist must be interpreted in metal by mechanical means. Cutting in wood is not easy without proper tools—nor is modeling in clay. And both these efforts require a high degree of skill if a happy result is to be obtained. But when it becomes necessary to interpret these designs into hardened steel to make a die or mold for die stamping or plastic molding, highly efficient mechanical assistance becomes imperative if anything like economical production is to be obtained.

To hand-carve the intricate lines of a bas-relief into a chunk of steel or to cut the fine lines of delicately designed lettering into a steel mold, requires hours of tedious and painstaking effort backed by years and years of skill and experience. Few craftsmen with such ability are available today, yet with improved design making its influence felt in every field, the demand for this type of artistry becomes increasingly great and important.

Economical production demands economical methods and the pantograph has long been used where

enlargement or reduction from an original drawing was desired. The two-dimensional pantograph was inadequate, however, for the reproduction of bas-relief in three-dimensional molds. Its principal was sound but its action could only be reproduced upon a surface that was flat. It was of no value in making molds.



New three-dimensional pantograph for quickly engraving difficult molds in steel

Now comes a three-dimensional machine, made by the George Gorton Machine Company, that will reproduce from models of stone composition, plastics, hard wood, etc., or from metal templates and master copies. Reproduction ratios range from one-half to one-eighth size of model or master. Similar machines have been made in Europe, but the American machines have several important advantages over foreign machines of similar types. Perhaps the most important of these is that the cutter spindle and tracer are always truly vertical with relation to work. Depth of cut is not obtained by hinging the pantograph, which would tend to cause an undercut on one side of a deep mold.

Two sizes of machine are available. One will cut a maximum size cavity 6 in. by 12 in., and almost any depth in one setting. It can be reset for larger work. This size machine will take cutters to 1/4 in. diameter and has six spindle speeds, 3800-9900 r.p.m. driven by 1/4 h. p. motor. The larger machine will cut a maximum cavity 9 in. by 18 in., and can be reset for larger work. It takes cutters to 3/8 in. and has nine spindle speeds from 1100- to 9200 r.p.m. It requires but 1/2 h.p. motor to operate.

Molding for better design

(*Continued from page 19*) small, compact parts as efficient or better than any of the old, larger ones, and a design that would be in harmony with today. How well the engineers accomplished their task is evidenced in the new "900" Masterphone line pictured here.

Combination Masterphones are only slightly larger than the original Masterphone which did not include the ringer, coil and condenser in the instruments. Here, too, are new, compact, attractive wall Masterphones, which because they utilize the same small parts establish a new standard for small wall sets. All these new instruments have the same handpiece as that of the original Masterphone. This handpiece is of all molded phenolic construction, with the capsule type receiver and non-positional transmitter, consequently the same talking efficiency is maintained.

Going another step further, Kellogg engineers adapted the same new small ringers, condensers and induction coils to a beautifully designed plastic case and offered the smallest and most attractive desk set box the industry has ever known. The parts in all of these handsets and the boxes are interchangeable with one another. Now it is no longer necessary to hide a desk set box under a desk or in some dark corner.

These sets can be purchased equipped in three ways: as a complete combination set with ringer, coil and condenser; as an extension set with ringer and condenser only; or, as a regular set with no ringer, coil or condenser, for use with the telephone company's present desk set box. Because of the standardization and interchangeability of the new small parts, the telephone man can start with any of these three types and add or subtract the parts at any time to meet any requirement. Those companies which are not seriously confronted with the demand for combination handsets are adopting this new Masterphone less the ringer, coil, and condenser and using it with the new small molded desk set box for present installations. When the time comes for converting to combination sets, the telephone man takes the parts from the box and uses them to build up his combination Masterphones.

These new telephones are made for two types of service, generally known as common battery manual and dial. Dial service is confined mostly to a few of the larger cities where several or many exchanges are interconnected within one city. Common battery manual service is more popular with subscribers and more practical from the telephone company's standpoint because of the greater flexibility and lower costs of that type of equipment. The problem of designing dial type telephones is to make the mechanical dial unobtrusive and at the same time provide a compact instrument pleasing to the eye. To accomplish this, Kellogg engineers designed the dial type combination Masterphone for desk use and the dial type wall Masterphone for wall mounting. Obviously they could not adapt the manual desk set to dial service since considerable space is required for the dial and this would take away the trimness of the instrument.

Close to a hundred sketches and dozens of models were made before the final designs were chosen for these instruments. The designs selected had to measure up to six predetermined basic requirements: (1) They

must be small and compact and very little larger than the original Kellogg Masterphone which does not have the ringer in the base. (2) They must be of such weight and design as to be easily picked up with one hand. (3) They must be rugged and durable. (4) They must accommodate all necessary units in the base without making it difficult to inspect or remove any part. (5) They must be pleasing to the eye, have lasting beauty, and have a permanent, lasting finish. (6) They had to resist the corrosive effect of perspiring palms—a most difficult requirement. The entire tool, die and molding job was done in the Kellogg plant. The making of the dies presented a number of difficult problems and three commercial die-making companies turned "thumbs down" on producing the job.

The base of the manual combination set is molded in one piece in one operation. One of the problems here was the arrangement for inserts which provide the two archways in the center bar directly under the handpiece. An ingenious floating insert was the answer. The front and back of this instrument are identical, and the ends are identical to one another. To keep these sides and the ends identical meant precision tooling and painstaking effort. There was no allowable tolerance in matching the curves and angles. There is a hole molded in the back for the cord outlet, and a recessed panel in the front for mounting a number plate flush with the phenolic surface. Another hole is molded in the center upright column between the archways to accommodate a plunger which actuates a switch in the base when the handpiece is removed. An arrangement of pull-out inserts made possible the molding of all these holes in the same operation. The molds provided for extra wall thickness at all points of strain, and the section thickness varies from $\frac{1}{8}$ inch to $\frac{1}{2}$ inch. Parting lines were kept on outer surfaces which expedites finishing. In fact the molds are so accurate that no parting lines are visible.

The base of the dial combination desk Masterphone presented similar problems to the die makers. It is molded in two pieces; the cradle bolted to the base; and both pieces have a vertical hole molded in the center for the plunger. A hole is molded in the front surface for the mechanical dial and another hole in the back for the cord outlet. Each piece of this 2-piece base is molded complete in one operation.

Upon inspection of the inside of the bases, there will be found numerous brass hexagon studs molded into the phenolic housings. These studs have a threaded hole in the center and to them are screwed the various pieces of equipment.

The time and expense involved in the development of a completely new line of telephones such as this, are of such proportions that the costs must be amortized over a period of years. Likewise the telephone companies' costs for all of their equipment is spread over a long period on the basis of monthly rentals to the telephone subscribers. However, Kellogg engineers are not content to rest on their laurels and are constantly striving to make good products better. The people of the United States have always enjoyed the finest telephone service in the world, and whether the subscriber lives in the smallest town or the largest city, that subscriber will continue to enjoy the finest facilities engineering ingenuity can provide.

Modern merchandising

(Continued from page 35)
stamping that forms the metal portion of the socket. The solution of these intricate problems in mold design, produced a molded piece that required a minimum of hand labor for the insertion of prong and switch parts. In point of fact, wiring—as commonly conceived—was entirely eliminated, the current being carried from the prongs through the switch and into the socket by means of flat brass clips.

Thus a fairly complicated mold—with perhaps a high mold cost—is used to produce this part at a decided saving in assembly and material costs. This practice is, no doubt, common in the electrical field, but it is particularly worthy of note in this instance, where the savings thus produced have opened up a tremendous and previously untapped market.

In the case of the snap-on shield or shade, no such mold complication was necessary, a two piece mold being ample to form the part. But, here too, ingenuity in applying old facts to a new use played a vital part. Advantage was taken of the flexibility of a comparatively thin section of plastic molding to develop the snapping feature, without using a metal clip or any other device that would have involved extra costs in molding or assembly. Nite-Lite is molded of Resinox by the Plastics Products Company.

Stoves, too, sell on appearance

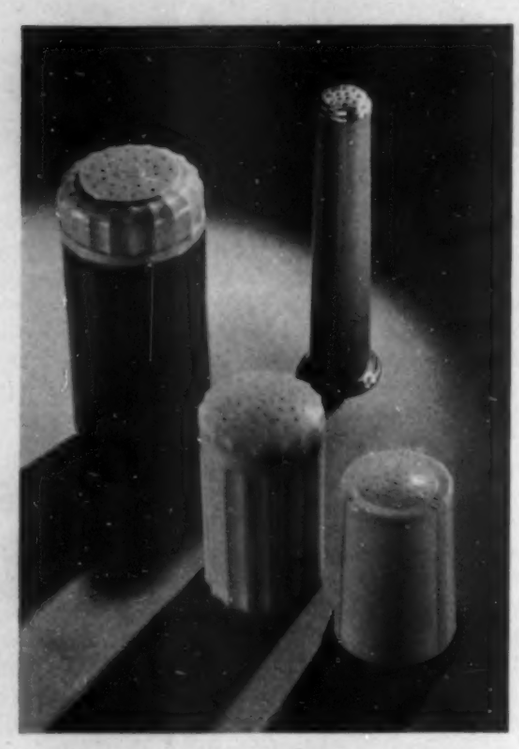
(Continued from page 20) affixed to the stove in black phenolic, with a center portion of ivory urea.

More recent are the handles (illustrated) in the design of which advantage has been taken of the beautiful effects obtainable through combining plastics and metal. Such effects have been obtained through snapping chrome strips into depressions in the molding, or by slipping the male sections of plastic end-pieces into a rectangular, chromed center section, and then

6. A wide variety of sizes and shapes of handles and knobs which make effective trim on modern stoves

bolting the two plastic pieces to the stove door. The possibilities of this happy combination of metal and plastics are legion, and stove designers have been reasonably prompt in realizing the fact. Incidentally, plastic material manufacturers have exhibited considerable foresight generally in advocating such combinations of plastics with other materials, in the interest of good design.

Among the improvements manufacturers have made in their new stoves which are in a large measure responsible for many trade-in sales must be listed the wide variety of heat control devices to replace the



7. Condiment shakers molded of light colored ureas add to the business-like appearance of modern kitchens

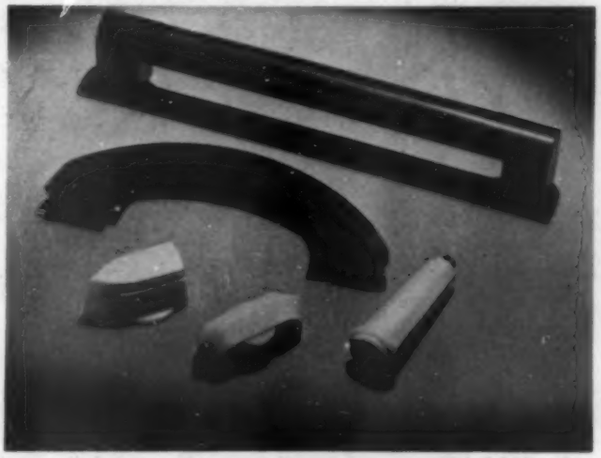
oven thermometer. The housewife need only turn a small round plastic dial to the desired temperature and she is secure in the knowledge that the oven will remain at the indicated baking heat. The degree markings are depressed in the plastic dial and wiped in with a contrasting color lacquer. Electric stoves go further; illustrated is a control mechanism mounted in a French gray housing molded in one piece, and matching the color of the trim. In the development of this mechanism, the engineer and stylist have combined their talents to produce a useful accessory "attractively packaged," which has a wide sales appeal to the potential buyer.

Speaking of accessories, there are many other devices which greatly simplify the cook's problems. For instance, if she wishes to boil food that requires a certain length of time and doesn't necessitate constant attention, she merely turns the pointer and releases the catch on a neatly mounted timing mechanism to the estimated number of minutes when the food should be done. At the end of the period indicated,

8. Lamp shade, handle and gas cock of translucent urea with metal design matching in each piece

an alarm rings to summon the attention of the cook. The timing gadget, located at the back of the stove, is in a plastic case with a translucent plastic dial face, and it is improvements of this nature that make the stove more convenient to cook on and easier to sell.

No manufacturer appears to have built a radio into a stove as yet, but most electric ranges have built-in clocks. This has eliminated one of the cook's favorite excuses for a dinner served half an hour late, but she likes it, and likes being sure that a three-minute egg



9. By hollowing out the interiors of these handles and knobs a considerable saving is made in material

doesn't go to the breakfast table extra hard-boiled.

Yes, the cook's life is getting progressively easier—at least three makes of electric stoves come equipped with efficient, translucent urea lamp shades mounted on the back. These are more attractive than metal shades, and stay cool. They are shatterproof, and much lighter than glass. Of especial interest is the lamp shade shown with the urea handles. Note that the designer has carried the same motif into each

piece, and an extremely attractive effect is obtained. This presents a concrete example of the advantage of using plastics in as many places as possible for decorative purposes, because it allows the designer to carry his motif from top to bottom of the stove. This is a truly intelligent appreciation of the possibilities to be found in plastics materials.

This covers fairly thoroughly the existing uses of plastics by the stove industry. It is doubtful if they will ever serve as a fundamental material in the actual construction of a range, replacing steel and other metals. But for trim, handles and accessories plastics offer advantages so compelling that their use has become almost universal. Larger and larger quantities of molded materials will be used for applications which have already been discovered and put into practice. Stove manufacturers have exhibited unusual ingenuity in recognizing and making good use of the characteristics peculiar to modern plastics.

In tune with economy

(*Continued from page 17*) durable lasting paint. These grilles are made in any color desired and of any design. If you are employing an accordionist in a bar which is decorated in a modern motif, the accordion may be made of white or black and the grille designed in a fashion suitable to the modern tempo. Not only that, but the name of either the player or the establishment may be engraved just above the basses which avoids theft and adds a personal touch to the accordion itself.

On the other hand, if the instrument is to be used in a band where the orchestra has certain identifying symbols or colors the accordion is the instrument which can reflect all these things in its case with little additional expense.

Ukuleles, guitars, drums and violins are favored with plastics as well. At the plant of the Fred Gretsch Mfg. Company we saw ukuleles made of wood, covered entirely with white cellulose with imitation pearl inlays on the head piece. Pegs were of the same material. Drums with the exception of the heads were completely covered with gay plastics and this company has produced a trap table which is designed to match the material used on the drum or may be matched to any other color scheme desired. This, too, is accomplished by laminating. The table holds cymbals, sticks and other implements called "traps."

Banjo backs are completely covered with cellulose plastics because of the decorative possibilities available. A highly ornamented banjo sells especially well below the Mason and Dixon Line and bright gay colors made possible through the use of plastics make it the local accompaniment to the songs of the South.

"We find plastics are about the least expensive compositions for the decorations we want," says Mr. Woods of the Fred Gretsch Mfg. Company. "A few years ago we used real mother of pearl for decorating our instruments but we discovered that plastics were equally effective and of course they have served to widen the market for our musical instruments. A violin using plastics can be sold today for less than one-third its former price. Then the light weight makes it even more desirable.

"We have another reason why we are so satisfied with cellulose materials, and that is that the applications are unlimited. Using a fibre, we can only obtain certain effects because of the wood's natural color and graining. To alter its natural appearance by using color or adding desired designs, additional expense is incurred. On the other hand, cellulose sheets are procurable in any one of myriad colors and with attractive mottled effects. The fibre breaks more easily and its field of application is limited due to these shortcomings."

We talked with a manufacturer of pianos seeking to learn the extent to which plastics have been employed on these more expensive instruments.

"On less expensive pianos," he said, "we use plastic

Drums, with the exception of heads, completely covered with bright plastics and a trap table designed to match the color scheme

keys. These materials have proved invaluable to us for numerous reasons. Keys of plastic materials do not yellow as do the ivory ones, and if there is any dirt accumulation, it is very easily removed. Then, there is the manufacturing angle. When ivory keys are cut, instead of the one operation being necessary, two are required. The reason for this lies in the price of real ivory. Keys are cut in a shape which allows for the insertion of a black note. If one operation were used in cutting, a small piece of ivory would go to waste and it would be an expensive process. Therefore we have to cut the ivory into two pieces which fit together so no excess ivory is obtained. In the plastic materials, however, we eliminate the second operation since the material's cost is nominal and it is not great extravagance to discard a small bit.

"You will remember," he continued, "that I said that plastic keys are used only on the inexpensive pianos. It may seem strange to you, but the consumer of the expensive instrument clings to a preference for traditional ivory. We believe that plastics are much more practical, but until this romantic theory is dispelled, we shall go on manufacturing the higher priced pianos with ivory keys. Frankly, we cannot understand this consumer resistance, since the plastic materials offer

clean keys which will retain luster and an attractive appearance indefinitely."

There has been, however, quite an extensive application of molded plastics to the organ as was fully described in the May, 1935, issue of MODERN PLASTICS. The Hammond Organ which has since become the "pet" of many popular dance orchestras in hotels, and the instrument which proudly dominates many lovely homes and radio broadcasting studios, has adopted molded urea and phenolic keys and foot pedal controls. The organ has become an outstanding success in its field and piano manufacturers might do well to consider that no strenuous objection to its plastic keys has been made.

In our search for musical instruments made of plastics we discovered a plan in its embryonic stage to manufacture mutes of either molded or machined plastics. We asked their designer why he preferred these materials to the conventional wood.

"Mutes are more durable when made of plastics," he told us. "Fibre chips and their constant insertion and removal from the mouth of an instrument requires that the mutes be made of a substantial, durable material. The fact that they do not absorb moisture makes deterioration a negligible factor. Then, too, appearances must be considered and the mottled effect of the cellulose plastics or the colorful decorative possibilities of molded plastics make the sales angle most appealing."

Musical instruments are becoming less expensive every day, partially due to the increased use of plastics to replace the usual, more expensive materials. They offer novelty in decoration, attractive appearance, durability under constant strain and handling, light weight, and lasting finish. What more can any manufacturer demand in his search for ideal materials?

What is this injection molding?

(*Continued from page 23*) part. Since there is no data on the necessary thickness of runner, it is usually best to start with a small one and enlarge it until perfect parts are injected. It will be found that gate sizes vary with every new design and shape.

With most materials it is necessary to select the entry point of the gate into the cavity to insure the maximum strength to the part. This is necessary since the material flows into the cavity and assumes a grain similar to the grain in wood, parallel to its flow. The part will split readily, parallel to this grain. If the part is mottled, the gate must be placed in the proper position to get the best mottled effects in the proper place. The correct temperatures and pressures required are also problems which are confronting both the molders and the material manufacturers. Since there are so many variables that affect both the temperature and pressure, the material manufacturers cannot set specific figures. For instance, fairly simple parts may be injected at a low temperature and pressure, while complicated parts, requiring less material may need higher temperatures and pressures even to fill the mold. This may sometimes be traced directly to the size of the gate and the resistance to the flow of material in the gates before entering the cavities.

We can appreciate the many problems that enter

into the mold design when we stop to realize that the material is forced into a closed mold, which is cooled. The material must flow around intricately shaped cavities, sometimes turn two or three right angles before filling the mold, and its plasticity is changed as it flows. Many and sometimes all of these difficulties can be overcome in mold design. Also when we realize that all the materials change in their flowing characteristics with each selected grade and even with a change in color of the material, we know the molder and the mold designer have a multitude of obstacles to master.

Injection molding, however, has reached a point where all industry is interested in the possibilities it presents for the rapid manufacture of industrial and commercial parts. The automobile industry has found this type of molding invaluable in developing body-hardware in which a core of metal is given a molded shell of acetate plastics with colorful decorative advantage. Building hardware can be manufactured in

A recently developed automatic machine with cycle automatically controlled by electric time clocks to insure uniform production

the same way and has a multitude of advantages over metal not the least of which is color. Plumbing fixtures of the usual variety could learn a lot from injection molding and they would be so much better than the common garden specimens now on the market that they would step far ahead of any semblance of competition.

Molds used for injection molding need not be as expensive and heavy as those used in conventional molding. No chain-hoists are necessary to place them in the press. Furthermore, it is not essential that molds be hardened, and contoured surfaces of delicate dies are not subject to the risks of warping and distortion which so often happens in heat treating.

This type of molding also permits the insertion of delicate inserts which would likely be crushed by orthodox molding where both pressure and heat are suddenly applied. Compression molding is also likely to displace these inserts with a considerable loss to the molder by imperfect parts and a proportionate increase in the overhead costs of such production. Then, too, the fact that the mold does not have to be heated and chilled again before the molding can be ejected represents an obvious saving of time because with

injection molding the mold is always cool and parts set or cure with remarkable speed.

There are literally thousands of small parts which can be made economically through the medium of injection molding. And with the perfection of some of the new transparent resins now under development, these thousands of opportunities will rapidly increase.

Light and safe for aircraft

(*Continued from page 16*) vinylite X, and a plasticizer for improving and controlling the physical characteristics in their application to safety glass.

Approximately 1,000,000 pounds of vinylite resins were manufactured in this country last year and used primarily in decorative purposes and in the lining of beer cans. The other plastics, acrylic resins, are the polymers of acrylic acid derivatives, known commercially as Acryloids. The primary investigations on these latter substances were conducted in Germany. Remarkable elastic and tensile properties are exhibited by the new plastics. For example, at ordinary temperatures a film of polymethyl acrylate is tough and pliable, and so elastic as to be capable of stretching 1000% before a break occurs. In addition, these new plastics do not find it necessary to use a transparent adhesive bonding layer to cement them to the glass, as they possess pronounced inherent adhesive properties. It is claimed that laminated glass using these plastics is decidedly more resistant to impact than the older types, particularly at low temperatures, as they yield more to impact and absorb energy. If this is true a great advance has been made toward achieving a low temperature coefficient of plasticity, which is so necessary to the airplane application.

There are certain properties of safety glass which make them desirable on aircraft. The hard glass surface is resistant to the corrosive action of sand, dust, and dirt particles which impair the surface of plastic materials. This insures clear and undistorted vision for the pilot. On the other hand, laminated glass does not lend itself readily to curved surfaces, which are costly and difficult to prepare. As curved surfaces are required for airplane windshields and cockpit enclosures in order to reduce the drag of the airplane, the more pliable plastics are utilized without the presence of plate glass. True streamlining of the airplane is not attained until all sharp corners and abrupt surface changes are eliminated. Figure 3 illustrates a typical modern airplane, showing the application of transparent plastics over the cockpit enclosures. Not only do the transparent plastics lend themselves to curved surfaces, but there is a saving in weight over the safety glass. Compare, for example, the specific gravities of typical transparent sheet materials in Table I.

Table I
Typical Specific Gravities of Transparent Sheet Materials.

Materials (Typical)	*Specific Gravity* (at 20°C.)
Plate Glass	2.4 to 2.9
Cellulose Nitrate (Celluloid)	1.32 to 1.44
Cellulose Acetate (Rhodoid)	1.28
Ethyl methacryalate (resin)	1.18

Non-inflammability is another essential airplane requirement for the transparent plastics. The serious consequences of using a combustible material over the cockpit are too well known. This eliminates the cellulose nitrate plastics, which exhibit high inflammability.

Consequently, there are left for consideration the flexible, non-inflammable, transparent sheets of the cellulose acetate and the synthetic resins. Aircraft experience with the synthetic resins is limited at present in the United States, and one must rely upon reports of the applications of these transparent materials from abroad. From the present indications, the sheets of cellulose acetate plastics are appreciably more flexible than the transparent resins at the extremes of temperature already discussed. Both of the cellulose acetate plastics and the transparent synthetic resins become soft at 70 to 90 degrees Centigrade, and may be easily formed at this temperature, but the former is more flexible at lower temperatures. This is not entirely essential, for as windshields and cockpit enclosures become standardized in shape, they may be formed at a higher temperature to the desired form. However, for the present service replacement and maintenance, a flexible cellulose acetate plastic has its advantages, as it may be cut to any shape with heavy shears, or by scribing and breaking. Compare with this a transparent synthetic resin, "Glyptal," which is made from glycerol and phthalic anhydride. This material has been introduced in this country from England, where it has seen wide service. It is noticeably less flexible than cellulose acetate.

Other examples are the methyl or ethyl methacryalate polymers, which possess in addition to their clear, water-white transparency, marked hardness and toughness. Large quantities of these sheets are used on German aircraft, and sold under the name of Plexiglas. At least two American groups are manufacturing these products, one utilizing a pliable polymethylcryalate for laminated glass called Plexite, and the other specializing in sheet material. These polymers are used to advantage for glass substitutes in optical lenses and high ultra-violet light transmittancy. The light transmittancy for daylight is about 95%.

Among other synthetic resins which have been prepared in the transparent state are vinyl, vinyl-formaldehyde, phenol-formaldehyde, vinyl acetaldehyde, and others. The vinyl group has already been mentioned in connection with laminated glass.

Several manufacturers have developed cellulose acetate plastics for the airplane market. These sheets are satisfactory in flexibility and flame resistance, but they are not entirely impervious to sunlight and atmospheric conditions. The appearance of these sheet materials after several months of flying is quite startling, as the materials border on opaqueness. Not only is there a prevalence of scratches, cracks, and surface imperfections, but also a marked discoloration. Yet the industry is willing to suffer this in order to achieve flexible, curved, transparent sheets. The answer lies in plastics, but not the present ones, which blemish so easily. Of course certain products have been developed which are available for cleaning the surfaces and removing the blemishes, but these require the trial of time before proving their worth; and until then, periodic scrapping of the cellulose acetate sheet

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is necessary. A reversion to the laminated plate glass appears to be one solution, in which a hard surface is available for resisting abrasion. A reduction of glass layers and an increase of the plastic layer has been proposed by some manufacturers, as a suggestion for increasing the flexibility. The optical characteristics of *new* sheets of typical transparent plastics and plate glass are given in Table II.

Table II

Average Optical Characteristics

Product	*Average Light Transmittancy For Wavelengths* 4000-7000 Angstroms.	*Approximate Short Wavelength Limit (Angstroms)*
Plate Glass	90-95%	3400
Cellulose Nitrate plastic	84%	3200
Cellulose Acetate plastic	86%	3050
Vinylite	90%	less than 3000
Methyl-Methacryalate	95%	less than 3000

The development of transparent plastics as glass substitutes is a fascinating tale of research. The airplane industry in its demand for suitable windshields and cockpit enclosures has added more zest to the problem, by stating difficult temperature and physical requirements. The investigation centers on two broad classes of materials, cellulose esters and synthetic resins. The airplane awaits the ultimate product; whether it will be a homogeneous compound or a combination of two, it is not possible to say yet.

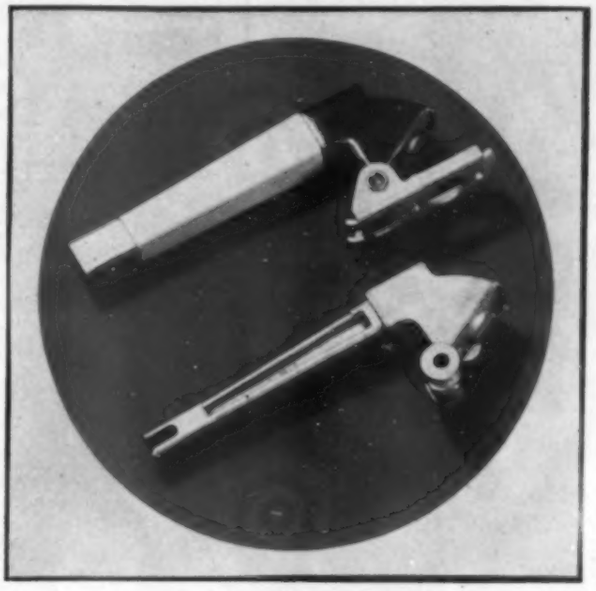
Plastics and die castings

(*Continued from page 29*) for the steering column have knobs and dials of plastic and the cases can be either die castings or moldings, as preferred. When die cast, the supporting bracket can be a part of the die-cast assembly, but if molded, a separate metal bracket is likely to be required. On the other hand, the plastic housing requires no finishing whereas the die casting requires enameling or plating. Such finishes are quite satisfactory in such units because little handling and abrasion occurs and the finish is likely to endure indefinitely. One very attractive assembly in plastics has a streamlined case of black phenolic and a front of urea with knobs of the same material.

Outside the automotive field, there are also many useful and attractive applications of die castings and plastics. Many Hammond clocks, for example, have die-cast zinc frames with plastic cases. Other clock makers, including Telechron and Miller, use both die castings and moldings in cases and bases, sometimes combined and sometimes separately. Black and many colors of plastic are beautiful in contrast with plated die-cast parts. Often the weight of die castings adds to the utility in castings for bases, and the color and translucency of plastic supply beauty to the object. When mold cost has to be avoided or when the great beauty and variety of cast phenolics are wanted, they are used with splendid effect. Moldings, on the other hand, come from the mold in practically finished form, with bosses for mountings, if desired, and no machine work or polishing is needed. What is true of clocks applies also to many other instruments, including those for industrial as well as for household uses, that is, plastics and die castings are combined to excellent advantage. In many instances the plastic, aside from its color and beauty, has the merit of acting as an

electric insulator. In nearly all cases, it tends to promote light weight, but if hard knocks are to be encountered, the sturdiness of the die casting may dictate its use to give added strength to the plastic material.

Nearly all office machines involve the use of die castings and plastic parts. Keys, handles, knobs, mouth pieces and transparent parts usually call for plastics, as do many printed dials and scales. Frames and a host of mechanical elements are die cast. Gears are generally made from plastic when silence and wear resistance are factors, but for low cost and rapid production, especially when clusters can be made in one piece, die castings are often used. The two may be



Refrigerator handle showing die-cast core and attachments with acetate sleeve handle.

combined to advantage in the same machine, as it is good practice to run a plastic gear in mesh with one of metal for the sake of quietness.

In desk accessories, die castings and plastics are again combined with very satisfactory results. Thus, the pen stand is often die cast, partly because weight is an advantage and may be plated or enameled or given a pleasing combination of these finishes, but the pen itself and usually its socket are plastic products because they present a better appearance and resist corrosion. If a clock is added or if a picture frame, ash tray, book ends, blotter holder, calendar stand, lamp or telephone be considered, a combination of die castings and plastics is nearly always the best solution, for reasons already outlined.

When hardware is investigated it is found that the union of plastics and die castings is a happy one. For strength and the gleam of bright metal, use die castings. For color, comfort and freedom from "static" sparks, as on door handles, use plastics. This is true for door hardware, desk hardware and refrigerator hardware. In the refrigerator door handle illustrated, the zinc die casting gives strength while the plastic handle gives beauty and a pleasant tactile quality never present in metal.

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While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.

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